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ABSTRACT

Four of the articles in this publication discuss the remote sensing of the Earth and its resources by satellites. Among the topics dealt with are the development and management of remote sensing systems, types of satellites used for remote sensing, the uses of remote sensing, and issues involved in using information obtained through remote sensing. Other articles deal with the following topics: broadcasting in Saudi Arabia, possible threats to air traffic safety posed by interference between radio navigation signals and other radio signals, unexplored options for public service and citizen information uses of satellite technology, major problems in Arab mass communication studies, and the use of radio signals in searching for life on other planets. Brief notes are provided on broadcasting events in the United States and many other countries, including the United Kingdom, Belgium, the Nordic countries, Ireland, and Angola. (GW)

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News About Information

CONTROVERSIES seem to encourage muddle. Where protagonists differ, and strongly, on an issue, the need for rational discussion is that much greater. But the opposite often happens. Controversies sometimes even seem to encourage ambiguity. Phrases are treated as slogans and become substitutes for thinking. Some phrases that contain extremely complex words are reduced to labels for a particular point or a partisan claim.

One of the most notorious phrases in current use is the "free flow of information". This expression is used indiscriminately to cover extremely disparate phenomena. As a label, it is used to introduce surreal jumbles of ideas about television news; frequency allocations; rules for direct broadcast, and Earth resources, satellites; transnational data flows; the distribution of movies; and all this, and more, without much thought about the connections.

It is tempting to say that everyone knows what is meant by the "free flow of information". Such unanimity would be agreeable. But a moment's thought shows that the claim, however desirable, is not true.

To start with, we would have to agree a definition of what is to be understood by "free", by "flow" and by "information" – each concept taken by itself and in combination – and to do this for all possible circumstances.

The word "free" is chronically ambiguous. It has quite separate financial, legal, cultural, and more, definitions. To say that someone or something is free – or that an act is free – means many different things. The ambiguity was neatly illustrated by a British broadcasting executive who up-dated the newspaperman's convention that "comments are free, facts are sacred" to "comments are free but facts come very expensive". Anyway, information can never be free in the sense of costing nothing. It requires investments of energy, skills, time, as well as of money.

The word, "flow", is similarly awkward. The traditional idea of flow (eg, the flow of a river) is one-way. Later, the word began to be used to mean the one-way collection and dissemination of information. But should "flow" be two way; or even a more complex concept of "multi-flow"?

Information, too, has several meanings that are absolutely different. To a broadcaster, information programmes are the news bulletins and news and current affairs programmes. To the student of information theory, information is a non-redundant, non-noise, message that is efficiently transmitted and received (and broadcasters are beginning to accept that viewers may take in as much information from a studio game as from a prestige news programme). Lawyers and computer programmers, journalists and governments, have their own ideas about what constitutes information.

The term 'information flow', then, indicates a multitude of processes and products. It can refer to the transmission of news about political goings-on; the maintenance of prison records; the updating of stock market prices; the warning of a typhoon; the sale of technical know-how; even the travel of a film star.

Each country deals with these information processes and products in a different way, according to its national characteristics. Its national attitudes towards the maintenance of prison records, for instance, will be formulated much as its attitudes and policies on other aspects of prison and detention.

These national characteristics obviously carry over into the international arena. They have to be reckoned with; they are the starting-point for most discussions. To ignore these differences is to invite muddle and confusion (conversely, to insist that national characteristics and attitudes have global validity, has the same result).

The international debate on these and other controversial matters needs to be lifted to a rather higher level of rational thought, if it is to make any sense.

This issue of 'InterMedia' reports on a new kind of information flow that clearly shows our present uncertainties: the remote sensing of the Earth and its resources. The stakes here are much too high for us to risk using slogans in place of thought, or ambiguity in place of coherence. • J.A.H.

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Viewdata to Start Public Service Next Year

THE UK Post Office will start a public Viewdata service in early 1979, a year earlier than planned. The decision reflects the Post Office's confidence in Viewdata, and the interest shown in the system both by UK groups and by telecommunications authorities in other countries.

Viewdata centres will be built in London, Birmingham, Cardiff, Edinburgh, Leeds, Manchester and Norwich. Three further centres may be built. The Post Office has budgeted $23 million as start-up capital.

When it goes public the Viewdata services will have a capacity of 250,000 pages. Among the 150 'Information Providers' already involved in Viewdata are Reuters, Westminster Press and Eastern Counties Newspapers; a new company called Fintel, set up specially by the 'Financial Times' and Extel to serve Viewdata; the British Printing Corporation, IPC, 'Exchange and Mart', HMSO and Guinness Superlatives; the Consumers' Association and the Department of Prices and Consumer Protection; Barclaycard and Access credits cards. The inclusion of the last two mean that it will eventually be possible to use Viewdata to make financial payments. For instance, a user wishing to travel from London to Paris could use Viewdata to discover the times of the main flights, to reserve a seat and also to pay for it.

One hundred of these organisations have so far promised to supply information in the public service, making 100,000 pages of information.

Each Information Provider pays three sets of charges. There is an annual fee of £250, a storage charge of £1 per page per year, and a rental of £400 per year for the Post Office terminal that puts the information into the system.

An important factor in the Post Office's decision has been the fairly substantial support of the electronics industry. So far, eight UK companies have marketed a range of 11 different TV sets that can receive Viewdata (as well as the BBC's and ITV's broadcast types of teletext).

Meanwhile, the Post Office is continuing as planned with its public trial this June in seven London boroughs, in the Birmingham area and in parts of Norfolk. About 1,500 users will take part, instead of 1,000 as originally planned.

The Post Office is also actively marketing the Viewdata system to telecommunication authorities in other countries. The West German Bundespost has already bought a system package including the GEC 8040 computer and a considerable amount of software. Negotiations are continuing with several other European countries and with Australia.

The only substantial competitor to Viewdata is the French TicTac (Terminal Intergré Comportant un Téléviseur et l'Appel au Clavier). TicTac is being developed by the Centre National d'Etudes de Télécommunications at Rennes. In certain respects it may be more sophisticated than Viewdata. But CNET's development of its system is not so far advanced and there is unlikely to be a public service for some time.

Both the UK Post Office and the French PTT are looking at ways of arranging a European standard.

In the USA, the Post Office has joined with Insac Data Systems Ltd to set up a US marketing operation. Insac is a new firm set up by the UK National Enterprise Board, which channels government monies to UK companies who cannot trade satisfactorily without outside finance.

The Post Office expects to invest about $100 million in Viewdata over the next ten years, and to show a profit. Information Providers (IPs) are also hoping to make money by means of Viewdata. Some will hope to do so in the UK market alone. But, like today's book publishers, most Viewdata IP's will probably look to the world market for their profits.

By working with Viewdata each IP will quickly accumulate a data bank, and considerable expertise in operating it.

Both assets – the software and the management skill – can be easily marketed around the world. Indeed, many Viewdata enterprises, such as the 65,000-word encyclopaedia planned by the British Printing Corporation, are unlikely to pay for themselves unless the costs can be shared by overseas co-producers of both print and electronic material.

Belgium Passes New Decree on Broadcasting

A NEW decree on radio and television has been passed by the Cultural Council for the French-speaking community of Belgium.

Broadcasting in Belgium is run by two separate public organisations: Radiodiffusion-Télévision Belge (RTB) and Belgische Radio en Televisie (BRT).

The decree affects only the French-language RTB. It replaces the 1960 law with a more wide-ranging set of regulations that recognise, above all, the strength of regional and cultural independence.

The basic structure of a state monopolistic corporation operating three radio and two TV channels remains unchanged.

The name of the corporation, however, is changed from RTB to Radiodiffusion-Télévision Belge de la Communaute Culturelle Française (RTBF). The decree stressed the new body's independence from political control, and the need, conversely, for objectivity in the presentation of news and current affairs.

The responsibility for RTBF has been put in the hands of a Board of Administrators whose 13 members are elected by the Cultural Council for French-speaking Belgium. The administrators are elected on the basis of 'proportional representation' according to the respective strength of each political party on the council and in parliament.

At the first elections on 7 March the parties were allocated these seats: Socialists, 5; Social Christians, 4; Liberals 2; and Front Democratique des Francophones/Rassemblement Wallon, 2.

There will also be an Executive Council, which will include the president and vice-president(s) of the board as well as the executive managing director of RTBF.

Local autonomy is considerably increased by the strengthening of the regional production centres (the main ones are in Brussels, Liège, Mons, Charlerois and Namur). This move reflects the strong support in Belgium for greater devolution.

Nordic Countries Prepare for Major Changes

A WAVE of changes has hit the Nordic countries. The five countries are Denmark, Finland, Iceland, Norway and Sweden. At the regional Nordic level, discussions on the proposed Nordic satellite system continue apace. Nordsat's prime objective is to make available all national programmes to all countries. It thus represents a strong Nordic trend towards a regional structure encompassing all five countries.

There are many different opinions about Nordsat, for and against, and to some degree they vary within each country. It is also unclear how Nordsat might relate to the other European projects, both regional and national. The Nordic Council has commissioned further technical and financial reports on Nordsat; they should be ready by the end of the year.

In contrast to Nordsat's theme of supra-regional sharing, Denmark and Sweden are now considering proposals for their own national broadcasting systems that point the other way – towards more decentralisation, more local autonomy.

Denmark

The main items in the Danish proposal concern Danmarks Radio's exclusive right to broadcast radio and television programmes; the issue of decentralisation; the structure of the Radio Council; and the controversial question of the legal basis for the provision of radio and television programmes to the Danish merchant marine.

According to the government's proposals, the monopoly of Danmarks Radio will be changed but not, as is sometimes suggested, by the introduction of a parallel commercial system. Instead, the present regional stations will be transformed into independent institutions that will be structured in the same way as Danmarks Radio. Each regional station will be under the direction of a regional radio council. These councils will consist of 15 members: two to be nominated by the Minister of Culture, three to be elected by the staff, and six to be elected by local political bodies. The stations will be financed through licence fees whose level, as now, will be decided by the Finance Committee of the Folketing (parliament). The regional stations will produce programmes for Danmarks Radio as well as for their own regional transmissions. They will be required to set up a 'regional' body to co-ordinate these programmes and other matters.

The second major proposal concerns the Radio Council, which has overall responsibility for Danish broadcasting. The existing council has been heavily criticised on account of its size and the extent to which political considerations influence its decisions. The proposed reforms would make a much clearer division of responsibility between supervisory and management functions. The various administrative tasks now performed by the Council itself, involving day-to-day management matters, would be given to the Executive Committee, so that the Council can concentrate on the wider policy issues.

Council members are currently elected by political parties according to each party's strength in parliament. To lessen such political influence, the new proposal suggests that in future two members should be appointed by the Ministry of Culture, two members should be elected by the staff and the remaining 17 should be elected by associations of listeners and viewers.

Controversy has also surrounded the supply of TV material to the Danish merchant navy. Various trade unions with members in Danmarks Radio have asked for more money if their programmes are to be distributed in this way. Negotiations have been going on for some time, but have not yet led to any agreement. The government has now decided to make a statutory order that would oblige Danmarks Radio to provide TV material for these purposes.

The government's bill has been criticised on several major grounds. In particular, it has been said that its effect will be to increase rather than diminish the degree of government influence over the broadcasting organisations. This concern reflects the fact that the political parties, not unexpectedly, are divided over the question of whether Denmark should continue to have a single monopoly public service broadcasting organisation. The 'right-wing' parties favour private, commercial, competition in broadcasting whereas the 'left-wing' parties broadly support the existing situation. In the next few months, the government's proposals may have to undergo several compromises.

Sweden

The gradual process of change in Sweden started in 1974 when the Social Democrat government appointed a parliamentary commission into broadcasting. The commission published its report last April. Also last year, the Social Democrats lost power and were replaced by a coalition.

The new coalition government has now published a Broadcasting Bill. The bill supports the commission's rejection of the idea of commercial broadcasting. But it parts company with the commission in the crucial matter of the structure of the monopoly public service. Broadcasting in Sweden has always been the monopoly of Sveriges Radio, a national public service body. The commission suggested a measure of decentralisation within Sveriges Radio. The bill goes much further. It proposed that Sveriges Radio should be broken up and replaced by four new independent bodies. Like Sveriges Radio, these four new bodies would be public corporations. The role of Sveriges Radio would thus be reduced to that of an 'umbrella' organisation.

Of the four bodies one would be responsible for the three national radio channels; one for the two national TV channels; one for local radio; and one for educational broadcasting. Each corporation would have its own Board of Governors and its own Managing Director, and would be exclusively repsonsible for its own resources and programming.

The umbrella organisation – the residue of the current Sveriges Radio – would act rather like the parent holding company in a conglomerate consisting of a number of subsidiaries. It would be responsible for 'group' functions such as international relations, liaison with the Swedish telecommunications authority, long-term financial planning, and a range of administrative functions.

It would also act as a buffer between the government and the programme companies.

It would have a board with 15 members. Six (and the chairman) would be nominated by the government. Five members would be chosen by the existing shareholders of

Sveriges Radio (eg various popular worker and co-operative movements; the press; business) and two would be elected by the staff. The fifteenth member would be the Director General of the 'umbrella' organisation.

Its tasks would be fourfold. It would choose the members of the boards of the four programme corporations. It would prepare and submit to parliament the overall budget of both its own organisation and the four corporations. It would receive and allocate the licence monies. And it would allocate transmission time so as to co-ordinate the output of two or more corporations who wanted to use the same transmission facilities (for instance, if the corporations for educational broadcasting and local radio wanted the same facilities).

The bill also gives a sketch of the long-term future of broadcasting in Sweden. Not all the details, at this stage, are completed. But it envisages six distinct levels ranging from very small radio stations to the Nordsat satellite service.

The bill has been heavily criticised. It is argued that the present situation is more or less satisfactory and that reforms of the structure and administration are really not needed. Instead, it is said, the government should take steps to improve the quality of the programmes. The proposals have been interpreted as leading to more bureaucracy instead, as was intended by the government, of restricting bureaucracy. There are also doubts about the costs of the new system. Would it be worth the high costs that it is likely to incur? Should not the government be proposing the cheapest possible way of improving the programmes?

The governments of both Denmark and Sweden would like their proposals to be adopted within the current parliamentary sessions. Time is rather short. At this stage, it is too early to say when the bills will be passed, with what amendments, and what the final results will be.

In Norway, meanwhile, the Royal Ministry of Church and Education is preparing a new broadcasting bill. It is expected to present the bill to parliament later this spring. Also in Norway a Media Committee is looking at *all* mass media (from gramophone records to daily newspapers).

The next few months in Denmark, Sweden and Norway are likely to be rather busy – with implications for all five Nordic countries.

Council of Europe Seeks Wider Audience

THE Council of Cultural Cooperation of the Council of Europe has set up a new system for making its publications more widely known and understood. The Council (known as CCC) has over the last six years produced a series of interesting and useful studies on European ideas about uses of video.

The studies range from reports of experiments with light-weight video equipment to philosophical analyses of videography. They provide a virtually comprehensive account of European video experiments.

The CCC's new plan, following a meeting in Strasbourg, has three main strands. The first is the "systematic increase in the number of recipients of studies commissioned by the Council of Europe." The second is the "preparation of a directory of audio-visual documentation and study centres in Europe." The first issue of this directory may be published in 1978; thereafter, it will be updated periodically.

The third aim is the "preparation of a list of specialised journals and bulletins available in member states." An annotated bibliography may also be published.

Participants at the meeting in Strasbourg agreed that the CCC Secretariat should be instructed to commission a feasibility study on a European exchange of audio-visual products. The study would make a special analysis of the legal problems.

The Strasbourg meeting also asked that other organisations and meetings should give priority to the role and impact of audio-visual media on musical training and creation; the use of radio and TV programmes to stimulate children's creative talents; and, in the light of the Italian situation, to "determine the extent to which the current freedom of broadcasting stations fulfils the hopes placed in breaking the monopoly." These topics, with others, should be given priority, says the CCC, during the year.

A list of selected CCC publications is available, free, from the Council of Europe (reference: CCC/DC/77/77).

US Satellite Connects 24 Public TV Stations

THE US public broadcasting satellite system started operations on 28 February. The following day, 1st March, twenty-four public TV stations were linked by Western Union's Westar-1 satellite.

The 24 stations, in the South-East USA, had been connected by parallel AT&T landline and Westar satellite links since 1st February for tests and experiments. At the end of the month, the terrestrial links were cut off.

The remaining 246 public TV stations will be linked to the satellite during 1978. The country's 192 public radio stations are expected to be connected by the beginning of 1980.

The interconnection system is managed and operated by the Corporation for Public Broadcasting. It will use three (and later four) of Westar-1's transponders (each capable of handling a separate programme). Programmes can be injected into the system either by the Main Origination Terminal near Washington, DC, or by five receive-and-transmit Earth stations spread throughout the country – in Columbia (South Carolina); Hartford (Connecticut); Lincoln (Nebraska); Denver (Colorado); and a yet-to-be-announced site on the West Coast. The regional stations and the 143 receive-only terminals will pick up the signals and relay them to the TV stations.

The television portion of the system is budgeted at about £20 million. The bulk of the capital was loaned privately to CPB (£16 million). Each of the companies that operates a public TV station is paying £10,000 per station. Other finance has come from CPB, PBS and private foundations. The system is expected to recoup its costs within 10-15 years.

The benefits of the satellite interconnection are its cheapness, compared to terrestrial links, and its flexibility. The satellite's four transponders provide enough capacity to distribute not only the national PBS networked schedule, but a whole range of non-PBS programming which, it is expected, will come largely from independent producers.

Briefly

☐Irish Pirate Radio

Several pirate radio stations have been operating successfully in Dublin for several months. They have opened offices and taken advertising; and claim large audiences. Dublin's Lord Mayor is one of the many public figures who have welcomed the stations' programmes. Prosecutions have failed because the pirates, when caught, have managed to pretend their transmitters are mere amplifiers by extracting from them the vital 'transmission' components. Moreover debates in parliaments have revealed many MPs to feel that RTE's monopoly is unconstitutional.

The two most permanent pirate stations are called Radio Dublin and Alternative Radio Dublin.

Radio Telefis Eireann is planning to open local stations in Dublin and other towns later this year.

☐Belgrade Conference

The Conference on Security and Cooperation in Europe, after meeting in Belgrade for nearly eight months to review the Helsinki agreement, adjourned on 8 March. The 35 national delegates (33 European countries, Canada and USA) were able to agree a final document of only 1,000 words. It does not refer to the many issues of human rights that had generated controversy at Belgrade. One of the most practical points of the final document was the agreement to re-open the conference on 11 November 1980 in Madrid.

☐Working with VDU

A major project on the nature of working with a visual display unit over a long period of time has been set up by the universities of Berlin, Loughborough and Paris. The project will study the effects of journalists of working with VDUs for many hours at a time, and possibly make proposals for altering the design of the unit and the screen, and the VDU working environment. It will involve over 1,000 journalists, editors and printers.

☐Cable in Vienna

The city council of Vienna has given permission for a major new cable system to be built in the city. The overall project is being handled by the Telekabel Fernseh Vertriebsgesellschaft Wien, and the network will be operated by the KTV Gesellschaft Wien, which is owned by the council. It will initially offer six TV channels (two Austrian, three German [FR] and probably one from Switzerland) and about six radio channels. The cable's total capacity is 17 TV channels and 12 radio channels. The network will reach about 450,000 homes (virtually half the population of Vienna). Construction should start next year.

☐Hermes Continues

The powerful Canadian-US Communications Technology Satellite (CTS), which was launched in January 1976 and expected to last for only two years, is still functioning well. The Canadian Department of Communications has planned 21 experiments for what it has called the "bonus" third year of operations. The Hermes satellite (as CTS is now known) has carried out a most interesting range of diverse experiments in communications throughout Canada. Some projects have involved transmission to portable Earth stations with antennas as small as 0.6 metre (1ft 6ins) in diameter.

☐USA: Space Inquiry

The US House Space Science and Applications Sub-Committee has started discussions on a major report on 'Worldwide Space Activities'. The 600-page report was prepared by the Library of Congress's Science Policy Research Division and covers legal, economic, political and science policy issues.

☐New US Policy Post

US Deputy Secretary of State Warren Christopher has been appointed to formulate and coordinate US international policy and to serve as liaison officer to the new International Communication Agency (consisting of the former US information Agency and the State Department's Bureau of Educational and Cultural Affairs). Amongst those reporting to Mr Christopher will be Glenn Robinson, head of the US delegation to 1979 WARC.

☐Swaziland Starts TV

Swaziland started its first broadcast TV service on 1st February 1978. It is being run jointly by the Swaziland Broadcasting Service and a South African subsidiary of Visionhire, a UK television rental company. The station is in Mbabane, the capital, whose population is about 25,000.

Almost all programmes are being bought from overseas suppliers (the first day's programming came entirely from Thames TV, London). The station has been equipped by Philips South Africa on a turnkey basis and consists of relatively cheap and simple equipment, including several Sony U-Matic video-cassettes which may be used, with a time-base corrector, to generate signals for transmission.

☐Angolan News Monopoly

The Movimento Popular de Libertacao de Angola (MPLA) has announced that it "will hold a monopoly on information" in Angola. The propaganda department of its Central Committee has taken complete control of the mass media. As part of this policy, Radio Ecclesia, Emissora Catolica de Angola (set up under the mandate between Portugal and the Catholic Church) has been nationalised and its services incorporated in the MPLA's own broadcasting organisation.

☐PATU Convention Signed

The Pan-African Telecommunications Convention has been formally signed by 32 countries since being formally presented at the Pan-African Telecommunications Union's first conference in Addis Ababa on 9 December 1977.

The Union's first officers have also been elected. The Secretary-General is Mamadou Bobo Camara, Director of Plan and Telecommunications Studies of the Republic of Guinea. Rajab Yusuf, Director-General of the East African Posts and Telecommunications has been appointed Assistant Director-General. Both officers will take up their duties on 1st June. PATU operates as a specialised agency of the Organisation of African Unity (OAU).

IIC Annual Conference

The 1978 IIC Annual Conference will be held in Yugoslavia on 11-14 September. The hosts are Jugoslovenska Radiotelevizija (JRT). Further information from: Annual Conference, IIC, Tavistock House East, Tavistock Square, London WC1.

Remote Sensing: Photographing the Earth

by John Howkins, IIC

THE EARTH is being photographed. Being photographed, not much less than being painted or sculpted, can be an unnerving experience – especially the first time. The subject tends to have strong feelings. The Earth is beginning to realise that it, too, has strong feelings about how it is photographed, how the images are treated, and who uses them.

The realisation is due to the continuing success of a number of satellites and other space platforms that are engaged in the business of "remote sensing". The phrase means something different, and more precise, than simply photography. Its root phrase, "image sensing", includes the taking of all kinds of images, likenesses, and graphic representations, ranging from high-resolution photographs (electrical and optical) to the low-resolution arrays of dots generated by photo-cells, which are used to indicate cloud cover. The phrase "remote sensing" indicates that the "image" was taken or "sensed" by a satellite (or taken by some other device on a ship or balloon and immediately transmitted to a satellite).

The first remote sensing satellites were meteorological satellites; later satellites began to take images of the Earth's resources (details of these systems are given on page 9). Remote sensing systems are also used for military purposes.

It is the voluminous capacity of the current generation of Earth resources satellites that has made the Earth so aware of being photographed. The main Earth resources satellites are NASA's Landsat series. The two Landsat satellites use multi-spectral scanners to measure the radiant energy that is reflected from the Earth (the first Landsat's scanners worked in four bands; later models have more). Different materials absorb and reflect sunlight at different frequencies. For example, the frequency at which a plant will absorb sunlight depends upon its species, its age and its overall condition (such as its health and moisture content).

The way in which a field reflects the sun indicates the nature of the crop, the health of the plants, and so on. Stagnant water reflects energy at a different frequency from running water; warm houses from cold houses; metallised roads from 'dirt' tracks, etc. The satellite's multispectral scanners measure this reflected energy and then send it, in digital form, to Earth. The advantage of the satellites is that they can measure these things faster, cheaper and over much larger areas than can any other kind of survey.

Systems and applications in all kinds of remote sensing satellites are becoming ever more sophisticated. In 1979, the second Orbital Test Flight of NASA's Space Shuttle will carry a set of extremely advanced remote sensing equipment. The rate of innovation and development shows no sign of slowing down.

The most obvious aspect of remote sensing is this continual expansion of the power of sensors on board the spacecraft and the various devices for processing the data on the ground (the spacecraft themselves, in comparison, are usually derivates of other, earlier designs). It is true that simply as a technological achievement, remote sensing is remarkable. But what is much more significant is what the technology has made possible – and how that potential is being used.

The essential functions of a system of remote sensing are to provide, from a vantage in the sky, a series of images, of data, of broad swathes of the Earth; to do this at regular intervals; and to enable the people who receive the data to deduce the nature, extent and quality of what has been sensed. The ability of the system to produce images of the same part of the Earth at regular intervals (such as every nine days, at the same time of the day) is crucial. It enables the user to make comparisons; to observe trends; and thus to make predictions.

The technology of remote sensing, in effect, has opened up an entirely new set of global channels of information, with their own stocks and flows, and with their own peculiarities of behaviour. The data and information produced by remote sensing systems is quantitatively and qualitatively different from existing networks of flow.

These flows are restricted, at present, because remote sensing is youthful and fragmented. We are novices in the business. Like the audiences of Antoine Lumière's first moving picture in Paris in 1895, we are full of curiosity and wonder. Since the first Landsat was launched, however, a few people have appreciated the economic worth of remote sensing. We are far from repeating Lumière's remark that the invention "has no commercial value". But Lumière also never imagined the legal and political aspects of making and showing film; and we are as far from formulating the economic, legal, political, cultural issues which remote sensing has raised in quite new ways.

Development and Organisation

The development of remote sensing owes almost everything, in terms of its technology base, funding and operational modes, to the USA, particularly to NASA and the US electronics and aerospace industry; and to the USSR and its own technical and aerospace expertise.

The United States and USSR developed remote sensing primarily with regard for their own national priorities – political, industrial and economic. These domestic priorities are especially true of the important Landsat series. Although

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international participation was always acknowledged as a key factor in the programme' success, the development and operation of the programme has been firmly geared to the objectives of the USA and NASA.

The USA financed Landsat. NASA has estimated that Landsats 1 and 2 cost about £87 million while the fourth Landsat, to be launched in 1981, is budgeted at between £115 and £135 million ($230 and $270 million). The USA has also subsidised, to some extent, the costs of supplying the Landsat data. Up to 1976, users were charged only direct costs for the processing, production and delivery of Landsat data. After 1 January 1977, NASA's EROS Data Centre added some overhead costs; but users still do not contribute towards NASA's search and development costs, launch costs, or the reception and initial processing of data.

The USA clearly values the technical control that such ownership brings. A US government report, 'Worldwide Space Activities', which was prepared for the Subcommittee on Space Science and Applications of the US House Committee on Science and Technology in September 1977, gives two examples of the benefits of this control; both are taken from the USA's meteorological satellite programme but apply equally to Landsat. The report describes how the USA wanted to replace the simple vidicon cameras on its GOES meteorological satellites with more complicated scanning radiometers.

A number of countries complained. They argued that it was easier to extract information with the video camera than with the radiometer. It was also cheaper. The USA, however, which was prepared to set up the more expensive and complicated extraction procedures in order to obtain what it regarded as "more valuable data", proceeded to fit the radiometer. The report says: "If the choice had been made by an international organisation, technical conservatism might have prevailed". This point of the users' access to data is crucial; we will return to it later.

The second example, according to the same 'Worldwide Space Activities' report, "involves the daily management of the US system. When tornadoes threaten the USA, the GOES satellites are used for specific limited scanning. Ordinarily they scan the same area once each thirty minutes. However, when there is a threat of tornadoes they scan once every fifteen minutes. In order to limit the scanning, the satellite must be confined to the northern hemisphere, and southern America cannot be covered". Users in southern America might resent being deprived of the satellite's services; on the other hand, Landsat *is* an US "owned-and-operated" system.

Another dimension of the current situation is the relationship between NASA and those countries that set up Landsat receiving stations. Each country that builds a Landsat station must sign a Memorandum of Agreement with NASA that stipulates that (1) none of the costs of the station's costs are to be borne by the USA; (2) that the foreign cooperating agency must provide to NASA any data desired by NASA; (3) that the foreign cooperating agency will provide the data requirements of NASA to selected experimenters, free of charge, and to the public in the region of its station for reasonable charges; (4) and will grant to NASA the option to establish an access fee for each station; and (5) that NASA does not guarantee a continuing programme. After the first six months of receiving Landsat data, each station must pay NASA £100,000 ($200,000) per station per year.

Sensors and Sensed

Landsat is classified as an experimental project. One of its main objectives has always been to gain enough knowledge and experience to determine whether an operational Earth resources system was desirable; and, if so, how best to operate it. So far, no US organisation has put forward proposals for an operational system to be run in a global manner. None of the US agencies that are participating in Landsat (the Department of Agriculture, Interior and Commerce; the US Army Corps of Engineers; the Environmental Protection Agency and the Department of Transportation [Coast Guard]) have proposed long-range plans for either a US or a global operating system. Nor have any major user groups.

In other organisations, however, including the United Nations, proposals have been put forward for a wide range of international and global arrangements. To take the UN proposals first; the UN Committee on the Peaceful Uses of Outer Space prepared a suggestion in 1976 for a UN Data Dissemination Centre. The Centre would catalogue, store and interpret remote sensing data and provide facilities for "interested parties"; circulate available information; provide impartial advice and assistance; and organise training courses, and so on.

It has also been proposed that the UN specialised agencies should be invited, under their existing mandates, to handle the remote sensing data that is relevant to their work. For example, it has been proposed that data on agricultural matters should be handled by a centre set up within the Food and Agriculture Organisation (FAO); that data on environmental matters should be handled by an equivalent centre within the United Nations Environmental Programme (UNEP) and that data on non-renewable natural resources should be handled by the UN Secretariat. This proposal fits neatly with the existing arrangements whereby the World Meteorological Organisation (WMO), another UN agency, coordinates the handling of data from meteorological satellites.

Another possibility is that the European Space Agency will build on its existing Earthnet coordination programme for the reception and processing of data from Earth resource satellites, and set up a global system. The Agency launched a meteorological satellite last year and probably has the technical ability to build, launch and operate a sensing system for Earth resources; but there does not seem much pressure to do so; and ESA funds would be severely limited for such an entirely new project.

A final set of proposals involve a global organisation on the lines of Intelsat and Inmarsat (respectively the international telecommunications and maritime satellite organisations). These organisations consist of an assembly, which includes all members; an executive council; and a permanent staff. An immediate problem with setting up a similar international organisation for remote sensing satellites is that remote sensing is not so obviously cost-effective. An independent remote sensing operation run like Intelsat, on commercial principles, might not be able to trade profitably. But this objection only blurs over another more important issue — whether or not remote sensing should be run on commercial lines.

Resources and Users

The awareness of the subject matter of Earth resources and meteorological remote sensing does suggest another approach. We are talking about the Earth's resources and environment, about water, crops and forests, and about its climate and weather – fundamental matters – and about techniques which may allow system operators unprecedented views of these human and non-human natural resources.

The various systems for remote sensing the weather by meteorological satellites are able to build on the work of the World Meteorological Organisation. There are, it is true, several unresolved issues; but since these issues in general are those that affect, to an even greater extent, the operation of Earth resources satellites, we will deal with them in that context.

Earlier, we said that the essential function of a remote sensing system is to provide a series of images, of data; to do this at regular intervals; and to enable the people who receive the data to deduce the nature, extent and quality of what has been imaged. As a result, remote sensing has opened up an entirely new set of global channels of information.

The capacity of these new sensing devices is very large indeed. A single NOAA satellite collects about 10^{12} bits of new data every day. Landsat-C may be able to produce 250 million bits of new data every second. Each bit of data is then pre-processed, processed, stored, retrieved, routed, calibrated and interpreted by many different people through diverse channels.

The growing concern with remote sensing is largely due to these scientists' increasing skills and experiences in processing and interpretation, more so than to the increasing sophistication of the satellites in the air.

It is also these improvements in interpretation, rather than in the sensing itself, that do most to turn the original data into the kind of information required by the user. Improvements in the space segment are important, of course (although they should not be pursued to the extent that the data is redundant). The microwave sensors that are to be fitted to the next generation of Earth resource satellites, which see through dense clouds, are obviously a major technological achievement. But such innovations are only important to the user to the extent that they add to the stock of data that can be turned into significant information.

The primacy of the *uses* and applications of remote sensing data involves the primacy of the *user*. It is the users' needs and requirements – and capabilities – that should inform the development and operation of remote sensing systems.

It is from the users' point of view, then, that we should approach these enormous quantities of data, the new channels of data and information, and the processes of interpretation and dissemination.

Who are these users? A look at the list of applications of remote sensed data suggests there are many different users with many different objectives. They are often classified into two groups; the academic and the operational. But with remote sensed data this simple dichotomy is much too superficial. There are, first, many overlaps between the academic and the operational (eg, university geological surveys; land use surveys). And the variety of the data means that the operational category contains a wide range of users, some of whom have very little in common (eg, meteorological organisations and commercial mining companies).

More important than these users' definitions (at this stage, anyway) is the awareness that each user group or sub-group faces very great difficulties; one, in defining its own requirements in terms of remote sensing equipment and models and, two, in comprehending the nature and significance of the data and its potential for information. The collection of data is only half the story – and perhaps not the more difficult or the more important half. The treatment of the data, and its transformation into intelligible and useful information, poses an even larger series of problems. •

A selection of sources and texts on remote sensing, including those referred to in this survey.

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Remote Sensing: Satellites That Take Pictures

MANY SATELLITES are equipped with some kind of facility for remote sensing. Even NASA's ATS-6 satellite, best known for its communication experiments in the USA and India, carried a radiometer for taking full-disc pictures of cloud cover. There is a difference, however, between satellites for whom image-taking is a subsidiary activity (like ATS-6) and those for whom it is the primary objective. Here, we are concerned with the latter.

Full-time remote civilian sensing satellites generally have one of two aims: sensing the Earth's resources, or sensing its weather. The oldest and largest category is that of the meteorological satellites.

Satellite programmes – the spacecraft and their operations – are renowned for the complexity of their nomenclature, with names, numbers and acronyms combining and separating like biological cells under very great strain. All remote sensing satellite activities – but especially the meteorological series – exhibit this regrettable quality to an extreme degree. This note is intended to clarify the main examples.

The world's first meteorological satellite was launched by the USA on 1 April 1960. It was called a Television and Infra-Red Observation Satellite (TIROS) and was launched by NASA into a polar orbit as an experimental satellite. (The difference between an experimental and operational satellite is important for many reasons; not least because the ITU allocates different frequencies to each type, thereby effectively preventing an operator from re-classifying an experimental system as an operational system, or vice versa).

There were ten TIROS satellites launched between 1960 and 1965, progressively becoming more sophisticated and more productive. They were followed by the larger and much more complicated Nimbus series (1964-1975). Nimbus was intended to be the fully-operational successor to TIROS, but the spacecraft quickly proved too cumbersome and Nimbus was relegated to being a research series, at which job it proved most useful.

As a result of this hiatus, the new US National Environmental Satellites Centre (NESC) of the Environmental Satellite Services Administration (ESSA) inaugurated the National Operational Meteorological Satellite System (NOMSS). This system used a TIROS-based Operational Satellite that was originally called TOS, but which was re-named (as is customary for satellites when they successfully reach their orbital position) to become the first Environmental Survey Satellite – ESSA-1 – which reflected neatly if confusingly its grandparents own acronym.

Nine ESSA satellites were launched between 1966 and 1969. Some were fitted with vidicon cameras that took pictures of the entire area under view for later transmissions to ESSA in Virginia, USA. These pictures were exclusive to ESSA (the administration, that is). The remainder of the ESSA satellites were equipped with much simpler cameras which took pictures for immediate and relatively cheaper transmission to Earth where they could be received by anyone who could afford the right equipment (costing about £10,000). This second process is called Automatic Picture Transmission (APT).

The ESSA series was eventually replaced by the NOAA series operated by the US National Oceanic and Atmospheric Administration. The NOAA series used Improved TIROS Operational Satellites, known at ITOS. The first NOAA/ITOS satellite was launched in 1970, and the series is still continuing and being extended.

All these satellites – from TIROS to NOAA/ITOS – have been positioned in polar orbits (ie, north-south orbits over the poles). It had long been realised, however, that satellites on a geosynchronous orbit (35,800 km, 22,300 miles, above the Equator) have major advantages over satellites on polar orbits. Geosynchronous satellites stay over the same spot on the Earth's equator and so provide the kind of continuous imaging that is necessary for comparative analysis. Of course, geosynchronous satellites cannot view the extreme northern and southern latitudes – but that drawback is generally held to be outweighed by the benefits of comparative study.

The first Synchronous Meteorological Satellite (SMS) was launched in 1974. The first Geostationary Operational Environmental Satellite (GOES) was launched the following year, followed by two more. NASA operates the SMS series, while NOAA operates GOES. The main objective of both series is to provide the US contribution to the various projects run by the World Meteorological Organisation (WMO); particularly the World Weather Watch (WWW) and the Global Atmospheric Research Programme (GARP).

The main feature of SMA and GOES spacecraft is their much improved and strengthened Visible and Infra-Red Spin-Scan Radiometer (VISSR) which can scan both day and night, very fast, and to a high degree of resolution. They also carry the space segment of a Data Collection System (DCS) which collects and relays data from a wide range of other sensors mounted on ships, buoys, other spacecraft, etc. The SMS/GOES satellites can take in and relay data from 10,000 sensors every six hours – a prodigious amount of information. The data is relayed to the World Weather Building in Maryland, USA, and then disseminated to users.

The ITOS/NOAA and SMS/GOES series make up the USA's entire operational environmental imaging capability. ITOS is under revision; SMS/GOES seems almost entirely satisfactory; both will probably stay in operation for several years.

The USA has launched and operated by far the largest group of meteorological satellites; but some other countries and regions do have their own programmes.

The USSR launched a meteorological satellite in its Cosmos series in 1963 (the word 'Cosmos' is used to designate a wide

range of USSR spacecraft, and gives little indication of the satellite's size or application). It is believed that between 1963 and 1970, twenty-two Cosmos satellites had primary or secondary meteorological functions. Several USSR Molniya satellites are also believed to combine with their communications functions an element of weather observation.

The USSR's current meteorological programme is based on the Meteor satellite, of which 14 have been launched since 1969. For the WMO projects, it has planned a series of Geostationery Operational Meteorological Satellites (GOMS). The first GOMS was to have been launched in 1977, but it was delayed for technical reasons. No new launch date has been announced.

The European Space Agency has also set up its own meteorological programme. Its Meteosat-1, which is broadly similar to the SMS/GOES spacecraft, was launched last summer. Meteosat is an experimental satellite, although it does have some operational applications. It is Europe's main contribution to the important WMO projects.

Japan's first operational Geostationary Meteorological Satellite (GMS) was also launched last year, on 14 July. The GMS was built by Hughes Aircraft under contract to the Nippon Electric Company (NEC) and is being operated jointly by the Japanese Meteorological Space Agency and the National Space Development Agency of Japan. Like the SMS/GOES spacecraft, the GMS has a sophisticated VISSR (in fact, its radiometer was based on that in the SMS).

Landsat

The second major category of remote sensing satellites is marked by the monitoring of the Earth's resources. This term is rather loosely used to indicate the imaging of the Earth's surface (and near surface) in order to gain information about the physical and human resources that are present. The most usual 'resources' that are imaged in this way are agriculture, minerals, fish stocks, etc, and patterns of land use. The pioneer satellite series has been – and still is – the NASA series originally known as Earth Resources Technology Satellite (ERTS) and re-named, on successfully achieving orbit, Landsat.

The Landsat spacecraft are patterned on NASA's Nimbus spacecraft. Each weighs 953 kg (2,100 lbs) and is 3.04 metres (10 ft) high and 1.52 metres (5 ft) in diameter. They use vidicon TV cameras, geared to different spectral bands, but imaging the same ground scene.

Landsat orbits the Earth at the height of 920 km (570 miles). It completes a complete circle once every 103 minutes, or 14 times a day. On each orbit the spacecraft views a strip of Earth which is 185 km (115 miles) wide. On each orbit, it views a different strip. Thus after 18 days it managed to view every part of the Earth at least once. With two spacecraft the pattern repeats itself every nine days.

Landsats orbit the Earth in a sun-synchronous, near-polar, orbit. This kind of orbit means that each spacecraft crosses the equator, and every other spot on Earth, at the same time (local time) every day, when the sun's lighting is more or less uniform. This uniformity is helpful for the comparative analysis (the majority) of the images returned to Earth.

Landsat-1 was launched on 23 July 1972. It was expected to operate for one year but actually survived until 16 January 1978 when it was retired. Its efficiency was somewhat lessened by the failure of its two tape-recorders (one in 1972, the second in 1974) but it managed to transmit a considerable amount of data directly back to Earth.

Landsat-2 was launched on 22 January 1975 and a third Landsat (currently designated Lansat-C but to be renamed Landsat-3 if orbited successfully) was launched on 6 March 1978. Landsat-C has five spectral bands, instead of four. It will also process and relay data in digital form, which promises to be much more efficient and faster. For example, it will probably be able to transmit a full scene in about two minutes instead of its predecessor's 35 minutes.

A fourth Landsat is scheduled for launch in 1980. It will be a second generation Landsat, with numerous innovations over the first three. The most striking, perhaps, will be its Thematic Mapper, developed by TRW Systems, which will replace the current multispectral scanner. The Thematic Mapper has six spectral bands (in the range 0.52 – 12.5 um), resolution to 30 metres in the visible spectrum instead of to 80 metres, and a data rate of 110 megabits a second instead of 15.

All data from Landsat is picked up by the three US Landsat Earth stations and distributed to the Department of the Interior, the Department of Agriculture and the NOAA. Similar Landsat stations are operated in Brazil, Canada and Italy; two more are being built in Iran and Japan; and one is planned for Argentina. Many other countries are likely to build Landsat stations in the early 1980s.

The International Telecommunication Union (as noted a above) makes a clear distinction between experimental and operational systems, and allocates a different bit of the spectrum to each. The USA designates Landsat as an experimental system and therefore operates it in the ITU band reserved for such space research and experiment; that is, 2,290-2,300 MHz. The bit of the spectrum allocated to operational systems, known as Earth Exploration Satellite Services, is 8,025-8,400 MHz. Landsat satellites cannot be declared operational, and stay in the lower band, without infringing ITU regulations. The USA must therefore decide whether to continue the Landsat series as an experimental service or – perhaps with Landsat-D – to upgrade it into an operational system.

Landsat is the major series of satellites currently carrying out the remote sensing of the Earth's resources. However, many countries are very aware of the benefits of the Landsat programme (particularly the benefits that accrue to the chief operator of the system) and are planning their own systems. The USSR launched an Earth resources satellite on 26 May 1977. The satellite relayed data to Priorda, the Soviet Earth resources data processing centre, before being retired on 8 June 1977. Further satellites in the same programme are planned for the near future. India's Aryabhta series also has some remote sensing capacity.

The European Space Agency is considering the French Satellite d'Observation de la Terre (SPOT). The 800 kg spacecraft could be ready by 1983, and could be launched by the ESA's own rocket, Ariane. So far, however, France's enthusiasm has not been rewarded by the ESA accepting the SPOT as a European project. •

Remote Sensing: Uses Around the World

REMOTE SENSING satellites have already accumulated an enormous amount of data. Most users combine the data with other survey results to do something more quickly, more cheaply, more efficiently; sometimes, to do something that, without such data, was impossible. This section lists a few of these uses.

Marine Resources (France, Thailand, USA)

Landsat images of water have been used in a multiplicity of ways. Electricité de France, the French electricity supply company, has used Landsat data to analyse the Loire and Cotentin estuaries for the siting of a nuclear power plant.

Exxon Inc have used Landsat data to choose sites for their oil rigs in Thailand's Andaman Sea; the data shows clearly where the stresses of surface and deep-sea waves and currents will be weakest and where, therefore, the rigs will be safest.

By registering certain changes in the colour of the Atlantic Ocean off the coast of Louisiana, Landsat images can show the likely presence of menhaden (a fish like herring).

Checking the Accuracy of Existing Data

Most Landsat data covers areas or resources that are already known, if only slightly. In some cases, the Landsat data reveals startling discrepancies between this 'old picture' and the Landsat-derived 'truth'.

It has long been accepted, for instance, that the gathering of statistics in many countries is influenced, and the results highly distorted, by political, religious, cultural and other considerations. Estimates of national and tribal populations are notoriously unreliable. Remote sensing cannot help in estimating population sizes, of course, but it has corrected many estimates of other resources, as these three examples show.

India. The Indian remote sensing satellite, Aryabhta, has discovered that village officials are under-reporting their village's rice acreage by as much as 50%. The reason is that the villagers are expected to sell to the state government at fixed prices four quintals of rice for every fertile acre and one quintal of rice for every non-fertile acre. There is therefore a very strong incentive to pretend that very few acres are fertile. The implications of under-reporting goes beyond the state government's loss of the 'proper' amount of rice at special prices. The national government needs to know the real situation in order to plan the ordering and distribution of food – especially when the harvest is bad.

The Indian satellite has also discovered that many of India's 'reserve forests' do not have any trees. The trees have been cut, and not replaced. This information casts doubt on the national government's claim that 22% of India is forest. It also, again, makes it necessary for the national government to re-plan its policies.

Thailand. Timber is one of Thailand's major resources and exports. In 1961, about 58% of the country was forested and until recently government believed the figure to have held steady since then. However, Landsat data showed that the forest area had actually declined to 37% of the total.

Brazil. Large areas of Brazil are virtually unknown. Maps of the interior are often vague. Landsat has revealed the existence of islands in the Amazon River over 200 square kilometers in size; it has show large towns to be wrongly placed by as much as 10 kilometers; and substantial rivers to be misplaced by as much as 20 kilometers.

Strip Mining (USA)

The importance of Landsat was shown in a similarly strikingly manner by its images of strip mining in Maryland, USA. Landsat data showed that up to 30% more of the state is affected by strip mining than had been recognised previously.

Landsat identified about 93% of the surface area that had been disturbed by mining – a much higher percentage than Maryland had been able to attain through its own aerial photography and ground inspection (even though the latter had just been improved).

The satellite was particularly useful in revealing the whereabouts of the "orphan mines" that had been abandoned before 1967 when a state law required that all strip mining areas must be reclaimed. Landsat's images indicated the older "orphan" mines as easily as the current mines. Half of the coal in the USA is obtained from strip mining, adding up to 2,300,000 acres, of which only about one third has been reclaimed.

NASA officials said that the Maryland images cost one-tenth of the normal survey (with aerial photography and field inspection) which would have cost between £9 ($18) and £11 ($36) a square mile.

Several other US states have used Landsat for making inventories of mining areas; they include Florida, Kentucky, Pennsylvania, Ohio and Tennessee.

Water Resources (global)

Another area where remote sensing satellites have proved to be more efficient than surveys done from aircraft or on the ground is in the measurement of snow and water resources. A study by Albert Rango, NASA, and K I Itten, Zurich University, has monitored the coverage of snow-covered watersheds in the USA. The size of these snow-covered areas, and the speed which they melt in the spring, largely determines the country's supply of water. Knowing the state of the snow can enable the water authorities to plan the most effective use of available supplies. Sometimes, it enables them to avoid drought.

Drs Rango and Itten say that "the advent of Earth resources satellites has for the first time provided an efficient and timely

means of acquiring measurements of snow-covered areas. It is evident from a number of investigations that measurements by Landsat and, in certain cases, NOAA-2, are as accurate as aircraft surveys, less expensive and hazardous and can be used to cover much larger areas." Compared to U-2 aircraft surveys, Landsat showed more detail and provided its results six times faster. A comparison between an ordinary survey plane and NOAA-2 suggested that whereas the plane would take about 40 hours to cover 20 watershed 'basins' and cost about £10,000 ($20,000), the NOAA-2 spacecraft would take about 16 hours and cost only £50 ($100).

Navajo Reservation (USA)

The Navajo Indian nation have started a two-year mapping of their 16 million acre reservation in south-west USA. Landsat is providing the bulk of the new information. The main priorities are given as "the prediction of harvests, an inventory of wildlife, timber and agriculture, and range rehabilitation".

Tobacco (Canada)

While passing over tobacco fields in southern Ontario, Landsat collected as much data in 20 seconds as would have been collected by the normal field surveys in two years. The data showed that the area fields had the right amount of water – not too wet or too dry, as the farmers had feared.

Urban Planning (USA)

Several cities have used Landsat data to draw up maps of land use. A system developed by the Los Angeles City Planning Department and refined by the planners of Tacoma, Washington, feeds Landsat data into a computerised Land Use Management Information System (LUMIS). The information stored and up-dated in LUMIS is expected to provide an extremely comprehensive and accurate picture of land use. Later, the system will be extended – in Tacoma, at least, to the city's Police Department.

The World Food Crisis (global)

The continuing shortages of the right food in the right place at the right time and at the right price (the four main elements of the "world food crisis") are likely to increase unless supplies and demands are regulated on a global scale. Such planning requires an enormous amount of accurate and up-to-date information. (It was the lack of information, especially on crop inventories, that aggravated the 1976 crisis.) Several Landsat programmes are being devised to provide appropriate information. For instance, the US Large Area Crop Inventory Experiment (LACIE), organised by NASA, NOAA and the Department of Agriculture, is measuring crop estimates, weather patterns, diseases, etc.

Navigation (North America)

Many sea routes in the far north and far south are closed for several months of the year because floating ice makes navigation impossible. The cost of closing these sea routes can be very high. The US Congress has estimated that closing even the Great Lakes from 15 December to April, as was the case until airborne surveys started in 1975, cost hundreds of millions of dollars each year.

A recent NASA exercise off Alaska showed the benefits of airborne and space sensing. A US Coast Guard plane equipped with NASA's side-looking airborne radar system (SLAR) flew over the area daily to get microwave imagery (the microwave sensors can 'see' through cloud and rain to get accurate images rather like ordinary black-and-white photographs). The data was transmitted to a GOES satellite which relayed it to NASA's Lewis Research Centre in Cleveland, Ohio. After rapid processing, the images were sent to the US/Canada Hermes (Communication Technology Satellite, CTS) which relayed them to Alaska where Navy experts in the interpretation of ice used them as a major aid in directing ships through and around the ice. The original data was also transmitted to the US National Oceanic and Atmospheric Administration (NOAA) which prepared regular ice forecasts.

NASA's evaluation of the experiment rate it as a "complete success". The airborne SLAR system will not be used beyond the 1977/8 season. But NASA's Seasat-A satellite, to be launched this year, will use more sophisticated equipment of the same type to predict ice movements with even greater accuracy.

Minerals (global)

Landsat data can greatly facilitate the search for minerals and metals. Some studies in *Pakistan* led to the discovery of the five out of 18 potential copper-bearing deposits that deserved excavation. The *Bolivian* government used Landsat data to discover lithium and potassium deposits. The *Egyptian* Iron and Steel Company used Landsat to discover iron ore deposits in the Western Desert.

Monitoring Timber Resources (USA)

The St Regis Paper Co, New York, became the first private company to collaborate with NASA over Landsat when it asked NASA/Landsat to monitor its forests in five US states – Alabama, Florida, Georgia, Louisiana and Mississippi. The company is using Landsat data (together with the results of aerial surveys) to identify different species of trees; detect changes in the trees' health; and estimate the likely volume of timber. Part of the agreement between NASA and St Regis states that "all software and techniques developed through this experiment will be considered to be in the public domain."

Routing a Pipeline (Bolivia)

A manufacturing company was faced with the problem of routing a pipeline between the gas fields of Santa Cruz, in central Bolivia, and a contact point on the north-east Bolivia/Brazil border where the pipeline would link up with a Brazilian pipe. Conventional planning methods had produced four alternate routes. Landsat data suggested another route, which was shorter and cheaper. •

Remote Sensing: The Uses of Information

by Edward Ploman, Executive Director, IIC

THE DEVELOPMENT of remote sensing by satellites has created a vastly enhanced capacity for the monitoring of the Earth and its environment. But is is a moot point whether remote sensing should be regarded as an intrinsically new activity or not.

It is usually perceived as posing new issues. But the novelty of these issues has less to do with the technology of remote sensing than with emerging concepts about information, and its use – or abuse. These concepts are new in a very real sense – so new that we have not been able to evolve an adequate or coherent framework for dealing with them. We find ourselves trapped in a series of ambiguities with immediate, practical, implications.

These concepts, issues, principles, may be expressed within a series of overlapping and interlocking contexts. The one common feature is the problem of how to deal with the communications/information dimension. Some of the major issues and contexts will be summarised here to indicate the nature of the problem.

Remote sensing systems can and are used for both civilian and military purposes. The main military use is for surveillance. Cries about "spies in the skies", however, are dangerously naive. The use of remote sensing technology for surveillance has become an important factor in current discussions of disarmament and the control of nuclear weapons. Remote sensing makes it possible to circumvent the issue of on-site inspection, which has always been one of the major stumbling blocks in the way of an international agreement. So even here remote sensing has been only partially understood.

It is therefore fair to ask: what makes Earth resources satellite so different? Does remote sensing via satellites raise new issues? These questions can be answered in terms of the nature of the data collected and in terms of its different actual and potential uses.

Weather information has for many years been considered to be a truly international resource. Weather patterns – like radio waves – do not respect natural boundaries. The exchange of meteorological data is vital for the protecting of life and property. The creation of the first operational weather satellite system therefore encountered almost no political resistance.

The establishment, later, of a system for sensing Earth resources, however, caused a great international political debate. One reason for this difference in attitudes is the different nature of the data collected. Meteorological satellites usually monitor global atmospheric phenomena. The data is crucial for the timing of flood and storm warnings. In contrast, the object or target of Earth resources satellites is primarily national territories, sovereign states; and remote sensing data can therefore have long-range strategic, political and economic significance.

The concerns expressed refer mainly to the *use* of the data. Some nations fear that other countries will use the data for politico-economic purposes, even for exploitation. Among certain countries, the concern is that others – whether governments, corporations or individuals – would be able to learn more about the resources of a country than was known by the country itself. This would place the country in an inferior position in negotiations about, for instance, the exploitation of natural resources.

This question of use relates to another set of issues which concerns the interpretation of national sovereignty. One of the basic principles of modern international law is that each nation holds sovereign rights to its natural resources. This principle is one of the basic features in the formation of a "new international economic order".

The new question being raised at the moment takes this issue to another level. It is asserted that national sovereign rights to natural resources include sovereign rights to information on these resources.

In the context of remote sensing, this attitude raises many thorny problems both in terms of information – its collection, dissemination, uses – and space law. One of the basic principles of the 1967 UN Outer Space Treaty is that outer space is not subject to national appropriation "by claims of sovereignty, by means of use or occupation, or by any other means" (Article II). The Outer Space Treaty only provides general guide lines but it has provided a basis for the elaboration of more detailed agreements governing specific aspects of outer space activities. Its Article II was used as a basis for agreements on the rescue of astronauts, liability for damage, and the registration of objects launched into outer space.

The advent of Earth resources satellites revived this question of the principle of sovereign rights over natural resources. Thus, the issues of national sovereignty entered the discussions of international space law.

Relatively soon, however, it appeared that the prevention or restriction of space activity was neither feasible nor desirable. Both kinds of control would interfere with international cooperation in studies of the Earth's atmosphere and oceans, in which all countries have an interest. The awareness of this mutually beneficial interest led to a consensus among almost all countries that a distinction could and should be made between space activity (ie, the collection of data via satellites) and ground activity (ie, the reception, treatment and dissemination of sensed data).

This agreement puts the issue squarely in the field of communications and information. It has led, in fact, to an even more important distinction. It has been proposed in the UN Committee on the Peaceful Uses of Outer Space that a distinction be made between *primary data*, meaning data acquired by satellite-borne remote sensors as well as pre-processed products derived from these data; and *analysed*

information, which means the end-product resulting from the analytical processes performed on the primary data (perhaps combined with data obtained from other sources than Earth resources satellites).

These issues have been given a high priority in the UN Outer Space Committee and are being discussed both in the Scientific and Technical Sub-Committee and the Legal Sub-Committee. At its last meeting, in 1977, the Legal Sub-Committee elaborated eleven draft principles. They include some provisions on which there is so far no general agreement as well as alternative wordings on a number of points.

The Scientific and Technical Sub-Committee has adopted a structure for describing in an orderly manner the system elements and the data flows that are involved in remote sensing. This structure comprises six distinct steps:

- data acquisition (by satellites and research stations)
- data reception (by antennas and receivers)
- data pre-processing (formatting and recording)
- data storage and dissemination (archiving and reproduction)
- data analysis (interpretation and user processing)
- information utilisation (practical application by users)

The phrase "primary data" is considered as referring to the products generated in the first four elements listed above; they are transformed into "analysed information" at the fifth level.

Another proposal has been made for classifying remote sensing data into global, regional and local information; but this proposal would not solve the major outstanding issues.

One of these major issues concerns the protection of national sovereignty over natural resources (as well as over the information on these resources). Opinions on this set of issues range over a wide scale. At one end, some states maintain that permission for even the collection and distribution of data must be given by the "sensed" state; while for other states authorisation should be required for the dissemination of data. At the other end of the scale are those states that oppose all restrictions concerning the distribution of data and support the principle of a free flow of information. Some countries have stressed the need to maintain a balance between the positive and negative aspects; and suggested a balance could be achieved by entrusting satellite remote sensing to one or several international bodies.

In the opinion of some countries, the focus should be on some international regulation concerning "primary data". In contrast, "analysed information" would be subject to *national* rules on intellectual property rights, secrecy regulations and other provisions on which it might be difficult to achieve international agreement.

Discussions on these questions will continue in the UN Outer Space Committee until the required consensus is reached. •

Remote Sensing: The Success of the WMO

One of the most successful examples of global cooperation is the World Meteorological Organisation. The WMO's main achievement is a global observation system which combines the meteorological capabilities of all 147 member states, and which constitutes the only global meteorological system.

The Convention of the WMO was established in 1947 and the Organisation was recognised by the UN in 1951 as a specialised agency. It coordinates and facilitates worldwide cooperation in meteorological study and observations. It is run by a World Meteorological Congress, which meets every four years (the next Congress will be held in Geneva next spring), and an Executive Committee, consisting of 24 directors of national meteorological services. Its annual budget is about £12 million. The Secretary General is David Arthur Davies.

The work of the WMO has been considerably affected by the development of remote sensing satellites and by computers, and by the high-speed telecommunications links between them. Its global observation system uses a whole range of devices, from traditional observing units to satellites, in a three-tier system of world, regional and national meteorological centres. There are three world centres (Washington DC, Moscow and Melbourne); 23 regional centres; and about 750 national centres.

The World Weather Programme consists of the World Weather Watch (WWW) which is an operational programme, and the Global Atmospheric Research Programme (GARP) which is experimental. In meteorology the division between the operational and the experimental is not always very clear. Weathermen and scientists are continually exchanging knowledge and ideas. WWW and GARP therefore overlap to some degree.

The **World Weather Watch** *originated in a UN General Assembly Resolution (XVI-1972), passed in 1961, which asked the WMO to set up a worldwide meteorological service to ensure that all WMO members obtained the meteorological observations and processed data that they required, for both operational and research work, and did so in a timely and coordinated fashion.*

The space segment of the WWW consists of four geo-synchronous satellites – two US satellites and one each operated by the European Space Agency (Meteosat) and Japan (GMS). The USSR GOMS satellite, whose launch last year was postponed, will make the fifth link in the geo-synchronous chain. Two satellites in polar orbit (one US, one USSR) will complete the system's satellite component.

The **Global Atmospheric Research Programme** *also originated in the United Nations. In 1962 the General Assembly asked the International Council of Scientific Unions (ICSU) to set up a programme of research into atmospheric science (Resolution XVII:1802). The result was an agreement in 1967 between the ICSU and WMO. The main aims of GARP are to extend the range, scope and accuracy of weather forecasts and to understand more fully the physical basis of climate and weather.*

The first GARP experiment tested the oceanography and meteorology of Barbados in 1969. It was followed by other regional and then global experiments.

The significance of the World Weather Watch, and GARP, is that they are the only complete, operating system of this scope inside or outside the United Nations system. Moreover, the WMO has extended its activities in recent years to include almost all environment issues. Its network of a coordinated multi-level observation system, data processing centres and dedicated telecommunications links, may provide an example for other similar organisations. •

Broadcasting in Saudi Arabia

InterMedia's series of articles on national broadcasting organisations continues with this report on Saudi Arabia written by the Television Department of the Ministry of Information. For further information on radio write to the Saudi Arabian Broadcasting Service, Ministry of Information, Airport Road, Jeddah; on television, write to the Saudi Arabian Government Television Service, Information Ministry, Riyadh. Apart from these government services, the only other broadcasting service in Saudi Arabia is ARAMCO Radio and Aramco TV, under the auspices of the Arabian American Oil Co., which provide respectively English-language radio and telecine operations.

BROADCASTING began in Saudi Arabia in 1949 (8th Hidja 1368 H). His Royal Highness, then Crown Prince Saud Ibn Abdul Aziz, on behalf of His Majesty the late King Abdul Aziz, used a radio system to congratulate the pilgrims on the Holy occasion and to welcome all to Saudi Arabia.

This first transmission of the Saudi Broadcasting Service followed an agreement between the Kingdom and International Standard Electric, a branch of ITT (International Telegraph and Telephones) Inc.

The agreement included the installation, transmission and technical administration of a radio station to serve the Kingdom of Saudi Arabia and the neighbouring Arab World. The agreement included the establishment and buildings of a station in Jeddah with additional studios in Mecca and the surrounding Holy Lands. His Royal Highness, Faisal Ben Abdulaziz, then Prince of the Hidjaz, was put in charge of the new station. A Royal Decree was enacted stating the government policy towards broadcasting, its aims and objectives.

The early programmes included religious and social talks, news, Arab culture, poetry and literature. Except for Army music and military marches from the Army Band, music was not allowed and up to 1950 no woman was allowed to announce, act or sing.

The Golden Age of Saudi broadcasting really began in 1960 when His Majesty the late King Faisal became King of Saudi Arabia. During his reign, extensive economic development was followed by equally extensive educational and cultural developments. The government gave high priority to information and broadcasting. Radio's daily output was increased from 7 to 17 hours and the extra hours used for more entertainment programmes and more programmes for workers, women and children, and the Army and security forces. Other innovations were that for the first time, Saudi women worked side-by-side with male announcers, and records and tapes of foreign female singers could be heard. Today, music takes up about 32% of the daily schedule.

The General Arabic Programme from Jeddah is now broadcast from 6.00 am to 6.00 pm and again from 7.30 pm to 2.00 am on 465 medium wave (647 KHz) and 31.3 short wave (9670 KHz). In the early evening, between 6.00 and 7.30, the 'Call of Islam' is broadcast on the same frequencies. The Holy Quran is broadcast from 6.00 am to 8.00 am and from 4.00 pm to 8.00 pm on a different wavelength, 188 medium wave (1594 KHz). Non-Arabic programmes are broadcast in English, French, Indonesian, Swahili, Turkish and Urdu, mostly on short wave only.

The transmitter in Riyadh, capital city, transmits a similar General Arabic Programme from 6.00 am to 2.00 am on five medium wave frequencies and fourteen short wave frequencies; and the Holy Quran, English and French services on separate medium wave frequencies.

Television Grows Fast

Saudi Arabia television began on 17 July 1965. Transmitters in Riyadh and Jeddah, each of 2 kilowatts, covered between 80 and 100 square miles in the cities and surrounding areas.

In the subsequent ten years the TV service has increased its number of stations and overall coverage and, most importantly, trained large numbers of Saudis as engineers, technicians and programme producers. The hours of transmission, and the percentage and variety of local productions and of news and information programmes, has also increased.

Five new stations have been built, two more in Riyadh and Jeddah, equal in technical facilities, and others in Medina and Quassim, also equal, and one at Damman. The position of the Damman station on the Persian Gulf gives it a special significance. It is reckoned to be one of the largest stations in the area both in terms of transmitter power and the extent and variety of its facilities. Several relay stations were also built to extend transmissions to most parts of the Western Province, where the Holy Places are located , and other parts of the Kingdom.

Programme hours have increased from an average of ten hours a week to about 50 hours a week. These figures do not include the one-off transmissions of important occasions such as sporting events and the pilgrimage rituals.

One of the landmarks of Saudi Arabia's TV development was the introduction of colour in 1975-7 (1395-1397 AM), which involved major changes in engineering equipment and the pattern of production. Colour transmissions started on 24 September 1976 (1 Shawwal 1396, the National Day of the Kingdom of Saudi Arabia), using the SECAM 3B colour system.

Because of its important position on the Gulf, the Damman station was equipped to transmit in both SECAM and PAL so that viewers throughout the Gulf area, most of whose countries use PAL, could also receive Saudi programmes.

The current breakdown of TV programmes is as follows:

Religious and cultural programmes: 25%
Variety, including music: 22%
Films and non-Arabic serials: 8%
Drama (local and Arabic): 15%
'Directive' programmes (for children, etc.): 15%
News and information programmes: 15%

During Ramadan, and the Pilgrimage season, a large number of special programmes are added, including live transmissions of the pilgrimage rituals.

An important ambition was realised on the night of 27 Ramadan 1977 (1397 AM) when the prayers were transmitted live by satellite for the first time and re-transmitted by over a 100 foreign TV stations. •

'Ghost Beacons' Threaten Air Traffic Safety

by John Howkins, IIC

TODAY'S PILOTS depend increasingly on the global network of radio beacons, each transmitting on a specific frequency, to guide them around the crowded skies. By tuning their radio compasses to the appropriate series of beacons, pilots can maintain the correct course, safely, at all times and in all weather.

Almost every aspect of society now depends on telecommunication – government, the media, industry, commerce, health services, education, military matters, as well as transport. As telecommunications gets cheaper, simpler and more efficient, and its benefits more attractive, larger numbers of organisations and individuals will use it, and use it extensively.

The proliferation of radio signals, however, may prevent the best use being made of the radio frequency spectrum on which the signals depend. Careful regulation, planning and coordination is increasingly necessary. Otherwise, radio signals on the same frequencies may interfere with each other – perhaps while other frequencies remain empty. In some cases, such interference could be extremely, even fatally, disruptive.

The possibility of interference between radionavigation signals and other radio signals, was discussed recently by Thames TV, London, in a 'This Week' programme: 'The Ghost of Bravo November', produced by David Elstein. The reporter was Peter Williams.

This 'InterMedia' report is based on the 'This Week' programme. It concerns a Viscount aircraft which crashed in France in 1972 and a Vanguard which crashed near Basle the following year. These two incidents are taken here as examples of what *could* happen if radio signals interfere with each other.

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A pilot navigates by following radio beacons. He will tune his radio compass to the frequency of the first beacon marked on the flight plan; the radio compass needle will point towards the beacon; and the pilot flies towards the beacon. When the plane passes over the beacon, the compass needle will swing around, and the pilot will tune to the next beacon on the flight plan.

Basle airport is on the border of Switzerland and France and run jointly by them. An aircraft approaching the airport tunes first to the Bravo November beacon, which transmits on 306.5 KHz, and then to Mike November on 335.5 KHz. After reaching Mike November, the pilot turns back towards Bravo November and, more important, tunes to the Instrument Landing System. The pilot should follow the ILS until he sees the runway.

By tracking the beacons and the ILS, each aircraft is able to fly in the correct direction and to make its turns at the correct angle.

On 10 April 1973 a Vanguard aircraft executed a perfect flight pattern, with all the correct directions and angles, but several miles south of the runway. The plane nearly crashed; and the senior pilot took over the controls.

The information recovered later from the "flight recorder suggests the Vanguard then turned to make another attempt to land. Captain Terry, the senior pilot, reported passing Bravo November, then Mike November, then Bravo November again. He then found what he reported to be the Instrument Landing System. In fact, far from approaching the runway, he was already south of it, and the true Bravo November and Mike November were ten miles to the north.

"At this moment, Captain Terry was only seconds from crashing. On the face of it, he was behaving irrationally, identifying beacons that were up to ten miles away, following a perfect flight pattern, but on a course so far to the south of the airfield that it had to lead to disaster" (extract from Thames TV transcript).

In fact, the aircraft, still following a "perfect flight pattern", crashed into a mountain 10 miles (16 kilometres) to the south of Basle airport.

The inquiry found that many factors contributed to the Vanguard's crash: "the air traffic controllers did not keep a close enough watch on the plane. They didn't pass on sufficient information on the appalling weather. Some of the aircraft's navigation equipment was badly maintained – wires were stuck together with household glue. The Instrument Landing System dials had been incorrectly adjusted during maintenance. As for the pilots, the official findings of the enquiry into the crash conclude: 'There are no clues or explanations as to what distracted the crew from their work, or had hindered their monitoring of each other. The crew's conduct is inexplicable'." (Thames TV transcript).

A further factor could have contributed to the crash: the existence of other sources of radio signals transmitting on the same frequency as the radio-navigation beacons; in other words, ghost beacons.

The possibility of ghost beacons had been raised the previous year, 1972, in the aftermath of the crash of a Viscount. The Viscount's pilot had reported that he was over a beacon, and approaching the runway when, in fact, he was 19 miles (30 km) away. The plane crashed into a hill. The inquiry's report blamed the pilots for being slipshod. It was asked if ghost beacons (perhaps from a nearby industrial plant) might have misled the pilot. But the report did not mention these possibilities.

The idea of ghost beacons was raised again, however, by the Basle crash. General Forestier, the vice-president of France's air crash investigation committee, decided to follow up various suggestions that had been put to him by carrying out a series of surveys, both on the ground and in the air, into the existence of ghost beacons in the Basle area.

The ghost beacons were sought by equipment that would

measure every signal at a given frequency, regardless of its use. The theory at Basle was that electricity power lines were giving off radio signals. This theory proved correct.

Electricity supply companies use their power lines to transmit voice and data signals within the network. The signals are known as Power Line Carriers (PCLs) and can take two forms: the quiescent carrier that is inactive unless actually being used and the continuous type that is active all the time.

The fact that power lines do emit radio signals (usually where the line bends, or joins another line; or where the earth conditions change suddenly) has been known by the electricity industry for some time (at least, the information has been made available in certain sectors). The quiescent carriers do not cause much problem. They are generally activated in short bursts, and the pilot's compass needle will swing momentarily and then return to fix on the beacon. Much more worrying are the continuous carriers, as the UK found out in 1965.

The UK's Central Electricity Generating Board used quiescent carrier signals until 1965, when they started to use continuous carriers. There were soon protests that over Watford, where planes stack for Heathrow, and at Luton Airport, radio compasses were behaving oddly. The CEGB investigated and "very definitely established that in flying over the power line the aircraft navigational aid equipment responded to the power line carrier signal, and gave an incorrect indication. Whereas, with the power line carrier equipment switched out of service, no such incorrect response was noted" (Thames TV transcript). The CEGB now chooses power line frequencies that are not already used by radio beacons.

The UK authorities passed on this information to other countries at a conference held in Rome in 1970. A conference committee was asked to prepare a report; but the report had not been published by the time of the inquiries into the Viscount or Vanguard crashes.

General Forestier's report, however, which was published in October 1974, did spell out the significance of ghost beacons. He sent the report to the investigators of the Basle crash; but they decided that his findings were not relevant to their assessment of what had actually happened. General Forestier also asked the French government to re-open the inquiry into the 1972 Viscount crash. The government refused; and General Forestier resigned from the Accident Investigation Panel. He is now head of the French Aeronautics school.

In 1974, however, Electricité de France, the French electricity company, stopped all power lines near Basle that were on 306 KHz (the Bravo November frequency). And in 1975 the French PTT instructed Electricité de France to change or discontinue about 80 Power Line Carrier frequencies (about one-seventh of the total). In 1977 it issued legislation that prevents Power Line Carrier signals from interfering with radio aids.

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Ghost beacons are only one example – albeit a vivid one – of the kinds of interference that could possibly happen if radio emissions are not properly controlled. They raise a number of issues that apply generally.

The need for the coordination of national allocations of frequency (as is already done at the international level) and national uses of radio is obviously an urgent necessity. (According to the Thames TV transcript, British Airways did not know until 1975 about the UK CEGB discovery that Power Line Carrier Signals could interfere with radio navigations). There is a further need for monitoring.

Second, such coordination and monitoring may have to take account not only of the more traditional radio services – eg, broadcasting, mobile radio, navigation – but of all emissions that may cause interference.

The appropriate framework for such work may be a national communications policy, which is able to take a sufficiently broad view of the various industrial, economic, technical, etc, aspects that are involved. •

ITU Conference Revises Regulations for Airspace Communications

A World Administrative Radio Conference met in Geneva on 6 February – 5 March to revise the frequency allotment plan for the aeronautical mobile service. This major intergovernmental conference was organised by the International Telecommunication Union, the UN agency that regulates the electromagnetic spectrum. The ITU uses the term allotment to mean the distribution of frequencies to areas (distribution to services is called allocation; and distribution to stations, etc, is called assignment).

The aeronautic mobile service deals with the management of frequencies for air-to-ground and ground-to-air communications. It deals only with civil aviation on scheduled routes.

Since the last ITU conference on the aeronautical service in 1966, air traffic has increased enormously. According to M Mili, ITU Secretary-General, passenger traffic has risen by 234%, and air freight traffic by over 300%.

The main theme of the conference was to introduce single-sideband (SSB) techniques into aeronautical communications. The advantage of single-sideband over double-sideband is that a radiotelephone link using SSB takes up half the amount of spectrum space, with no loss in quality. The ITU's aeronautical conference in 1966 had considered switching to SSB, but had finally agreed that SSB techniques were not yet reliable enough, and that members states should wait until all problems had been resolved.

The new allotment plan agreeed by the Conference allows 411 channels instead of the previous 171.

The Conference agreed to use higher frequency bands for aeronautic communications than the present ones – usually the HF bands between 3 MHz and 30 MHz – and also to use various techniques to reduce congestion and interference for transmissions that continued to use the lower bands. The current HF frequencies, which are reckoned to be too congested, are considerably higher than the MF bands, between 300 KHz and 3,000 KHz (or 3 MHz) that are still being used for radio beacons in a few industrial countries (as recounted in the main story this page) and in most developing countries.

Looking ahead to the ITU's 1979 World Administrative Radio Conference that will revise virtually all the ITU's Radio Regulations, the Conference recommended a "public correspondence service" should be opened up with aircraft.

The new Frequency Allotment Plan will come into force on 1 February 1983. The delay is due to the need for all operators to make substantial alterations to their equipment. •

Unexplored Options for US Public Service Satellite

Public Interest Satellite Association

TODAY THE USA finds itself at a crossroads in the history of telecommunications. The issues are summed up in the dilemma of communication satellites. Decisions made (or not made) over the course of the next several months will affect this and future generations for literally decades to come.

This article is based on a Public Interest Satellite Association working paper*. It attempts to bring to light certain perceivable elements of an impending crisis. The crisis is that US policy options for the development of affordable life-saving and learning telecommunications techniques are in danger of being foreclosed forever. The crisis is in satellite communications for public service and citizen information. Its elements are fivefold.

There is, first, the termination of the affordable use of that part of the spectrum called the Ku-band (12-14 GHz) – a highly desirable satellite band, now in experimental use by schools and hospitals – due to its impending monopolisation by commercial interests.

Second, the United States is losing its technological leadership in the field of satellite communications, particularly in the development of small Earth stations.

Third, NASA's future funding, research and development in the design and construction of low-cost, interactive satellite communications techniques is uncertain.

Fourth, the USA lacks any coherent planning for satellites; and there is poor policy coordination both within and between the government agencies that are responsible for satellites.

Fifth, the public sector's interest is inadequately represented before key policy and regulatory bodies, particularly in the planning of the US position at the 1979 World Administrative Radio Conference (WARC).

What Do We Need?

The questions of what do we need is the question of who needs it?

Any system consists of the user, the need, the problem, the technology, the costs and the applications. If these components are not defined accurately, then the design of the other components will clash, immediately and continuously.

J C R Licklider has said: "What more appropriate contribution could technology make to democracy than good channels of communication directed from every man to the foci of the society? From a psychologist's point of view, there is an important difference between interactive and non-interactive participation, which is crucial to the development, as distinguished from the exploitation, of motivation" (Report of the Carnegie Commission on Educational Television, New York, 1967). But what have we been given? A communications system that is designed primarily for one-way broadcasting.

The present communications systems have been designed with only a very narrow concept of who the "user" is. The user is seen as someone to be broadcast to. The needs of the user have been defined from the top down.

Suppose we rethought the entire communications system from the perspective of all users and their needs? At present, on the top, we have a communications system of unparalleled sophistication and efficiency (although, we ask, efficiency from what perspective?). On the bottom we have a vast population which not only does not have access to the communications systems and the information needed to survive, but which processes information at an extremely slow rate and, indeed, in another language. The top and the bottom are out of phase. How could we design a system that would meet their needs?

What we are talking about is a comprehensive, flexible, interactive, multi-purpose communication information network that includes a large collection of information and advanced facilities for storing, processing, transmitting, and displaying it.

Here are some of the needs: access to medical care in a time of escalating costs and the concentration of medical ability in a few areas; access to education at a time when the educational system is in a shambles; access to knowledge and the understanding of knowledge; the ability to communicate in time of emergencey and disaster; the flexible ability to tailor one's needs, as one becomes more and more aware of the options available for changing conditions; the ability to communicate with one's political representatives; and the ability to make oneself heard on the important issues that arise from time to time. Also needed is that such a system be technologically feasible and, considering both short and long range options, that it be cost effective.

The Department of Commerce's Office of Telecommunications has given four requirements for such a service: "Low station capital costs, low individual transmission costs, a high degree of 'connectivity' (a term that refers to the ease with which a user can be connected directly to the other stations in the network), and high data rates or bandwidths during short transmissions" ('Lowering Barriers to Telecommunications Growth', Commerce/OT, Washington, 1976).

What's Available?

Can these requirements be met with the satellite technology that is either presently in place, or expected soon be in use? The present US domestic communication satellites (domsats), as noted by the Department of Commerce's Office of Telecommunications (Commerce/OT) and several other bodies, are clearly inadequate. They have been designed to serve

*_The Unexplored Option: Critical Choices for Public Telecommunication 1977-2000_ by Andrew Horowitz and Wes Thomas. A Working Paper prepared under the auspices of the Public Interest Satellite Association, 55 West 44th Street, New York, NY 10036, USA. ©PISA.

large users (common carriers, television broadcasters, government bureaucracies, etc.) who require large volumes of communications. They use Earth stations that are both large (10 to 30 metre diameter antennas) and expensive ($50,000 to $2,000,000). Their services are limited largely to major urban areas and do not reach the sparser regions of the country where educational, medical, library and other social services are badly needed.

Moreover, because they operate in a frequency band (4-6 GHz) which is shared with other terrestrial services, they pose formidable technical and cost barriers which few schools, hospitals, and other small, poor, independent entities can overcome.

The Corporation for Public Broadcasting's nationwide $40 million satellite interconnection system, using Western Union's WESTAR satellite, may provide some opportunities for public service and nonprofit users. The prospects, however, are limited. Although more than 155 Earth stations are being planned for the television portion of the system (the radio network is still being designed), only five of them will be equipped to transmit as well as to receive. This will severely inhibit any fully interactive applications.

Is there anything now on the drawings boards that speaks directly to the needs of nonprofit and public service users? As far as we know, the answer to this question is "no" for any near-term commercial ventures. Outside Satellite Business Systems (the tripartite arrangement involving IBM, Comsat and Aetna Life Insurance), no US firm has announced plans to significantly advance the state-of-the-art of satellite technology in any substantial way.

And the plans being developed by SBS offer little optimism for the nonprofit sector. SBS interactive Earth terminals are being designed to accommodate the rapidly expanding data communications needs of the 'Fortune 500' companies. The high cost of the ground equipment – $350,000 to $400,000 – suggests that nonprofit users will have to search elsewhere to have their requirements met.

Will NASA's Public Service Communications Satellite be the answer? Public service satellite advocates hoped the PSCS might meet their needs. But the design that has emerged is considered by many to be little more than a glorified version of the ATS-6 plus the Canadian CTS.

It calls for four television channels (compared to two on CTS) and a UHF mobile channel (similar to ATS-6). NASA-Goddard convened two workshops, bringing together several hundred community organisations and public service representatives to aid in the PSCS design. One panel expressed concern that "the configuration offered was far less than the leading edge of the state-of-the-art" and was deficient in meeting multiple-user interactive needs.

Will Hughes provide an answer? A memorandum from Public Service Satellite Consortium (PSSC) President, John Witherspoon, to members of the Consortium announced that on "9 September 1977 Hughes Aircraft agreed that its SYNCOM IV satellite, in which the company will invest an estimated $14 million, would be devoted to public service, with PSSC responsible for aggregating the requirements of the several user agencies and managing the eventual services." The memo explains that PSSC will be responsible for defining the payload and arranging for its financing.

Design details, according to the PSSC, have yet to be worked out. but SYNCOM looks like being only a (slightly) improved ATS-6, and there will probably be no major public service experiments.

Is there any other option? Fortunately, there is, although few within the citizen organisation and public service communities have any idea of what it's all about or what its implications are for future, widespread, low-cost satellite use. The concept: *Multi-Beam Satellites.* The end-user benefits include small, low-cost terminals; the possibility of a large number of users at many locations; multiple frequency re-use; and on-demand user access. There are those who see the multi-beam satellite as the next major communications breakthrough in space.

The Multi-Beam Satellite

Designs now beginning to emerge from industry and government feature MBS with antennas ranging from 30 to 150 metres in diameter – huge structures that would dwarf anything now in orbit. These antennas' multiple spot beams could cover areas on Earth from 50 to 250 miles across. Because the beams are highly concentrated, users could access them with walkie-talkie whip antennas for two-way narrow band communications, and with antennas of 0.5 metre diameter (extremely small by today's standards) for interactive video.

A system of multi-beam satellites could make the most of the benefits of frequency re-use, and economies of scale. Leonard Jaffe, NASA's Deputy Associate Administrator for Applications has suggested that MBS could "help solve the growing conflicts concerning allocations of orbital space and the radio spectrum. When this happens, we will truly realise the ultimate economy of space in serving our communication needs."

Perhaps the most ambitious MBS concept comes from Comsat Labs. Its Orbital Antenna Farm (OAF) is a multiple-function space platform which will "furnish multiple communications and related missions support (or 'bus') functions, such as electrical power, structure, thermal control, orientation, station-keeping, tracking, telemetry, and command. Missions will include intercontinental, regional, and domestic telecommunications services."

Further support – and, to our mind, the most practical near-term MBS concept so far – has come from NASA's Jet Propulsion Laboratories. JPL envisages a public service MBS system that could be operational by 1985. It is considering antennas that vary from 47 to 79 metres in diameter. A 79 meter antenna could produce 200 spot beams, each covering an area of approximately 250 square miles. This kind of beam could service 250,000 people with hand-held UHF transceivers.

The JPL system would provide a cheap national voice network for rural mobile, rural telephone, remote medical uses and in cases of 'natural disaster'. The design assumes each user would need 20 KHz of voice bandwidth (an FM audio channel), which would result in a total system bandwidth of 8 MHz. This is a remarkably efficient use of spectrum.

But unless a major R & D satellite effort is initiated shortly, the critical spectrum may be allocated to satellite

system uses that are incompatible with MBS, and the MBS option foreclosed for the next 10 to 20 years. The realisation of the JPL plan, and of all other MBS plans, is tied to a much larger issue – the future of NASA in the field of communications.

Following the Federal Communications Commission 'Open Skies' policy, that turned the domsat business over to private industry, and a White House decision of 1973 (itself based on Bureau of the Budget memo R-76, Revised), NASA was phased out of R & D in communications satellites.

The policy of 'Open Skies' was based on the theory that the emerging US domsat industry would be in a position to foster the continued development of the technology to the benefit of all segments of society, public as well as private. That theory has not held up.

Over the past four years, the United States had begun to lose its technological leadership in the satellite field to other countries, particularly to Canada, Japan, and the Western European countries where major technical advances have been made in the development of small Earth station technology.

Commerce/OT views the situation in this way: "We seem to be observing a trend towards the loss of US technological leadership in satellite telecommunications and particularly in systems applications involving small Earth terminals . . . Except for the proposed SBS system [sic], US industry does not have an overall systems operation in the frequency bands of 12 GHz and higher . . . Also, government policies are either insufficient, conflicting or fragmented. And the development of advanced satellite technology appears to be slowing in this country" ('Lowering Barriers to Telecommunication Growth', Washington, 1976).

Let's assume that the development of both the MBS and small Earth station terminals is deemed to be in the national interest, and that NASA receives Congressional authorisation to pioneer the new technology. What is the optional frequency band (or bands) for the lowest cost public use? Here the multi-beam satellite comes up against its most formidable barrier.

Frequency Options for Multi-Beam Satellites

The International Telecommunication Union (ITU) has allocated several bands for satellite services worldwide, including UHF, S, and C.

UHF-Band. The proposed Table of Allocations in the FCC's policy statement for the 1979 WARC ('The Fifth Notice') shows 84 MHz of bandwidth (806-890 MHz) as being available for mobile satellites. Mobile satellite usage, however, is rated as a secondary service. The primary service allocations to broadcasting and mobile radio have priority. In fact, broadcasting and mobile radio are now engaged in hotly contested battle for the domination of this band.

JPL is proposing that 8 MHz of dedicated (exclusive) spectrum in this band be set aside for use by mobile satellites. Without such dedicated frequencies, large and expensive Earth stations are needed to prevent mutual interference with UHF-TV and mobile radio.

UHF has two main advantages for use by multiple beam antenna satellites; MBS antennas are feasible in the near term, and cheap transceivers, using existing mobile radio technology, are already available. If the FCC approves the dedicated use of 8 MHz, UHF could become a valuable band for low cost, narrow band public service satellite use.

S-band. (2.5-2.69 GHz) is allocated in Region 2 (North and South America) to both satellite and terrestrial services. It is one of the bands used by ATS-6, with the result that ground equipment is already in existence in certain regions of the country.

However, S-band has many of the same limitations as UHF for multiple beam satellite applications. The band must be shared with terrestrial services, causing severe limits on power flux density and necessitating larger, more expensive terminals to prevent uplink interference. And there is only 190 MHz of available bandwidth (45 MHz of this already allocated for fixed-satellite uplinking), not enough to meet public service and citizen information needs.

S-band seems to hold greatest promise for satellite broadcasting applications serving many relatively inexpensive receivers. Its potential for interactive communications seems remote.

C-Band (4-6 GHz) is probably the least desirable band for a public service MBS. It is rapidly becoming saturated with commercial domsats, and must be shared with a variety of terrestrial common carrier microwave systems.

Ku-Band (12-14 GHz) contains by far the most desirable set of frequencies for a MBS system. Unlike the previously mentioned bands, which must be shared with existing terrestrial services, Ku is being allocated for satellite use only. This means it will be free of any limitations on power flux density and, therefore, can be used by high power satellites and small, inexpensive ground stations. The Canadian CTS already operates in this band, on an experimental basis. Operational uses of Ku-band have not yet been allocated.

But recent developments suggest that Ku-band may turn out to be totally unusable for systems with multiple beam satellites and small Earth stations.

The problem is that Ku-band, like C-Band, seems destined to become monopolised by the commercial sector. Already, Satellite Business Systems (SBS) has been initially approved by the FCC to use all 500 MHz in Ku-band to establish a data, voice, video and high speed facsimile network serving the 'Fortune 500' companies. Western Union will be applying shortly for the same 500 MHz for its second generation "Advanced WESTAR" service, along with Telesat Canada, which plans some Ku-band satellites in the Anik series.

The basic issue is the relationship between a transmitter's size (in terms of the diameter of the antenna) and the width of its beam. The large expensive Earth stations (eg, in the Intelsat system) provide a strong, narrow, highly directional signal beam. These narrow beams have a high chance of avoiding interference (especially with other equally narrow beams). As the diameter of the transmitter's antenna is reduced, the beam is widened. The crucial and unanswered question is how small can an antenna be, and therefore how wide its beam, before it creates unacceptable interference?

Ku-Band is fairly popular. At least seven satellites are already planned for a fixed-satellite service in the 11.7 to 12.2 GHz band. These are the advanced WESTAR satellites (2), SBS (2), and Anik Band C (3). Moreover, two powerful Canadian broadcasting satellites are planned to be located right on both edges of the fixed satellite arc. These nine

satellites would leave no room for a public interest satellite in Ku-band for interactive (fixed-service) use.

On the other hand, the FCC may classify a public interest satellite as "broadcasting". In this case, there probably would be orbital space, but there would also be the problem of interference from other broadcast satellites.

What Can Be Done?

The preceding discussion raises far more questions than it provides answers. This should hardly be surprising, however, given what little really appears to be known about the whole issue of multi-beam satellites. If there is a conclusion to be drawn, it might be best summed up by what one FCC official remarked to us at the beginning of our investigations: "Things are in a mess". In the absence of even the most basic (and what several people in high places have said is the most essential) data of all – a precise definition of user requirements – international and domestic satellite policy for the remainder of the century is now being carved in stone.

Prospects for public service and citizen information uses of affordable satellite Earth technology seem very much in doubt. Why? Who's to blame? What *should* be done? What *can* be done? How much time do we have? Questions about technology, needs, cost-effectiveness, accountability, and the public interest have only begun to surface. Much more needs to be known and understood. And the public must be involved in both the learning and decision-making processes. The matter of our communications future, after all, concerns everyone's future. So does the responsibility to assure that it is designed to meet genuine human needs and engineered to preserve and promote essential freedoms.

We therefore encourage your response to this article. Please send in or call us with your comments and criticisms. What else needs to be considered? What areas require fuller and more in depth exploration? Who should be consulted and what documents and historical materials examined? And what have we left out? There seem to be three main areas of questions.

Regarding *user needs*, Commerce/OT asserts: "The lack of representation of small Earth terminal proponents and public service sector users in committee activities for the 1979 WARC – in the FCC, OTP, IRAC, and CCIR discussions – may result in ITU agreements which could have a long-term, unfavourable impact on US domestic satellite telecommunications" (Commerce/OT, 'Lowering Barriers to Telecommunications Growth', Washington, 1976).

Why has adequate public service representation been lacking? How can it be improved? Why hasn't a professional market study been undertaken to assess the communications needs and requirements of potential public service users of small Earth station satellite technology? Whose responsibility is it to conduct such a study? Who should pay for it? How should it be designed? By whom? What questions should be asked?

Is there a need for a government agency to take responsibility for assessing and forecasting user need, technological developments and constraints in satellite telecommunications and in evaluating the impacts of proposed services and regulatory decisions?

Regarding *national policy*, should the United States act to preserve its technological leadership in the development of advanced satellite communications techniques, in view of the progress being made by other countries?

NASA's Goddard Space Flight Center is proposing a Public Service Communications Satellite operating in the Ku and UHF bands. Has NASA assessed the interference potential, considering the presence of multiple satellites sharing the Ku-band? What about broadcast satellites? What are the regulatory issues involved with PSCS use of UHF? If dedicated spectrum is required, will the FCC grant it?

What are the projected costs of PSCS? What cost/benefit studies have been performed? Have these studies, if they exist, included benefits to society?

Regarding *regulatory and WARC issues*, the variables are even more numerous. Do multi-beam satellites need dedicated spectrum in order to allow the use of low-cost, small Earth stations? If so, how much? What would be the most desirable frequencies from both a systems performance and cost-effectiveness point of view? What would be most desirable for both the short- and long-term?

Should the present US WARC position regarding frequency sharing of the Ku-band between fixed and broadcasting satellites be reconsidered? Similarly, in light of the limited orbital arc available for high power satellite transmission in Ku-band, should the present US position of equally dividing the orbital arc among fixed and broadcast satellites be re-examined? For example, should more space be allocated to fixed (ie, two-way, interactive) satellite services? What assumptions are being made as to the long range relative benefits to society of these services?

What mix of satellite and ground terminal antenna size, orbital spacing, frequency assignment, transmitter power (both space and ground), and other characteristics will lead to the optimal utilisation of available spectrum-orbital resources and result in the minimal per-user costs?

Under the FCC's 'Open Skies' policy, these parameters are decided on the basis of the individual satellite company's own models of cost-effectivness. The overall public interest is not easily factored into this process; nor is it necessarily served by it. Do we need a national policy that guarantees the public an equitable share of scarce satellite frequencies and orbital slots? Should present policy be re-evaluated, particularly, in light of the potential commercial monopolisation of Ku-band?

For example, under 'Open Skies', SBS made the first application in Ku-band, so they got it. Is this a proper and fair procedure? Should the public, which has already invested heavily in ground equipment for CTS experiments, now be required to find a new band? Or, should the FCC's initial approval of the SBS system be reviewed?

Do SBS and the other major satellite companies appreciate the hardship that their potentially interfering systems will cause for schools, hospitals, libraries and other public services providers?

In light of all of the above, we ask the following final question: Should the President be called upon to declare a general moratorium on all 1979 WARC and related satellite policy proceedings until the problems and issues surrounding multi-beam satellites can be fully researched and the results openly debated? •

Major Problems in Arab Mass Communication Studies

A Riyadh University Report

THE TEACHING and training of mass communications is rapidly expanding throughout the Arab World. There are now about fourteen units in eight Arab countries, with another two underway.

The problems of choosing courses, curricula, staff and so on, led UNESCO in 1975 to suggest to Riyadh University, Saudi Arabia, that it hold a symposium on mass communication studies with special priority on practical matters. Riyadh University readily agreed to organise and finance the symposium, which was held at Riyadh on 7-11 January 1978, and to commission a report on the teaching and training of mass communication in the Arab World, which would serve as the principal working paper for the symposium. The authors of the report were Ahmad H Sawi, Professor of Journalism, American University of Cairo, and Hamdy Kandil, Chief, Free Exchange of Information and Policies of Mass Communication Sections, UNESCO. Their 114-page report, 'Teaching and Training Institutions of Mass Communication in the Arab World' (Riyadh University Press), provides a comprehensive and critical review; in both sectors, the current situation appears highly unsatisfactory.

We print, below, an extract on 'Teaching Staff' which illustrates many of the problems, and the attitudes taken towards them; and several extracts on training facilities and methods.

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TEACHING STAFF

The first remark which strikes one, and the most shocking of all, is the substantial shortage of specialised teaching staff in Arab teaching institutions ("a teaching staff member" implies someone holding a PhD degree and filling the post of assistant professor or lecturer at least). Through the questionnaire and in private interviews, almost all institutions were unanimous in stating that the shortage of staff was their main problem. Some of the interviewees described this shortage as "grave", others as "serious" or "acute". None of them was exaggerating in so describing it, for the figures available confirm what they stated and even more.

The Mass Communication Department at Riyadh University, for example, a mature department from which two classes have already graduated, has a teaching staff of only three members, all of whom are appointed on a contract basis. What's more, none of them specialised in journalism, although that is one of the department's branches of study. At the mass communication department of Baghdad University, there are only three staff members, all holding the title of assistant professor and specialising in journalistic subjects although the department consists not only of the branch of journalism and public relations but also of a branch for radio and television. Moreover, the Institute of Political and Mass Communication Sciences in Algiers has not one full-time staff member specialising in the field of mass communications. And so it is among all the teaching staff of the various institutions.

This acute problem has many serious effects on the study of mass communication in the Arab countries and their future. The following are some of the main ones identified clearly by our questionnaire results:

1. In order to cope at all, the institutions are compelled to resort to the help of some professional mass communicators. Though such professionals may have a high standard of occupational skills and long experience in their field, many of them lack the proper specialised and theoretical background knowledge which is essential for university teaching. No doubt, experience is important and can be sufficient for instruction if training and practical application is sought, but it cannot possibly be sufficient when academic theoretical teaching is required.

The team has noted, for instance, that the 'professional' lecturers at the Department of Journalism and Mass Communication of Um Durman Islamic University number six, whereas the full-time members of the teaching staff do not exceed two. At the Faculty of Mass Communication and Documentation of the Lebanese University, there are eight 'professionals', and not a single faculty member, specialising in mass communication courses. There are many other examples.

2. The institutions are also compelled to recourse to those who have not yet completed their post-graduate studies in the fields of their specialisation (eg, people who have obtained their MA and are still studying for their PhD, whether they come extramurally or hold the title of "Instructor"). Such people may help in teaching, but only within a partial and restricted sphere and under the supervision of members of the teaching staff. They are not yet sufficiently educated to assume the responsibility of teaching comprehensive subjects, particularly in advanced grades. Besides, it is throwing on these young men's shoulders a heavy burden that consumes a lot of the time and effort badly needed for their PhD studies. By way of illustration, we can cite Cairo University, King Abdul Aziz University and Riyadh University.

It is the policy of the University of Algiers, for a quick remedy to the problem, to secure holders of the MA degree, or its equivalent, to teach in the Institute, allowing them to complete their PhD studies later on. What is more serious is that Um Durman University uses some graduates holding a BA with "Very Good" mention for teaching some courses of specialisation. Though this may be "under the professor's supervision", as indicated in the questionnaire, it represents an unprecedented phenomenon.

3. Some institutions are compelled to recruit holders of PhD degrees whose post-graduate studies were not directly related to mass communication but were originally in other

fields such as Arabic literature or sociology. They do this, deceitfully, in order to fill the vacant teaching positions.

4. Some other institutions have recruited persons holding "doctorate" degrees which most universities do not recognise, and which are not really worth more than the "diplomas" given to students or trainees in training courses and special programmes.

5. Some of those who have been appointed do have a PhD in various branches of mass communication studies but since obtaining their degree have not taught for several years, have no connection whatsoever with the mass communication field and have never had any private academic activity such as writing or presenting papers to conferences.

6. The fact that some institutions rely basically on people appointed on a contract basis has laid a marked burden on the Faculty of Mass Communication at Cairo University. Not less than one-third of its teaching staff are seconded to other institutions every year; in spite of the fact that, according to the questionnaire, it considers the shortage of teaching staff members as its own main problem. Figures are more eloquent than any words. Five out of 14 staff members were seconded in 1976-77, while the number of teachers appointed on a part-time basis reached 58, and the number of students in the various grades reached 2388.

No doubt, the exchange of experience and services among Arab institutions is a desirable matter. Egypt's position has always imposed upon her a traditional role towards all other members of the Arab family in the field of education at its various stages. But the problem is that Egypt itself is now suffering no less than other Arab countries from the shortage of qualified staff in this field.

All this can be summed up in the following interconnected points:

- A marked fall in the standard of education.
- Teaching staffs that are overloaded and exhausted.
- The lack of the proper scholarly supervision and sound academic guidance for post-graduate students, in particular, due to the shortage of professors and their work overload.
- The shortage of research projects and studies in the various fields of mass communication, and the poor standard of some publications whether written or translated.

The Libyan Mass Communication Department was so conscious of this acute shortage that it decided, according to the questionnaire, to reduce the number of courses in the academic year 1977/78 while increasing the number of fellowships abroad for obtaining PhD degrees.

Nevertheless, many people are still attracted to the idea of establishing new colleges, institutes and departments for teaching mass communication. In 1975/6 the Faculty of Arabic Language at Al-Azhar University founded a new department of journalism and mass communication consisting of three branches. Three other universities followed the year after. The Faculty of Arts at Assiut University founded a department for journalism; King Abdul Aziz University at Jeddah founded a three-branch department for mass communication; then Imam Mohammad Ibn Saud University in Riyadh founded a higher institute for Islamic advocacy consisting of two branches, one of which is for Islamic mass communication. Al-Azhar's department has only one professor, while Assiut University and King Abdul Aziz University have appointed only one associate professor each. And Imam Mohammad University is still looking for someone to be contracted.

TRAINING FACILITIES

Ten Arab states have national training centres for mass communication – or have started to establish them. There are also some quasi-regional training centres, most notably in the Gulf area, and in Cairo. The dominent position of Cairo is due to the Egyptian Broadcasting Training Institute, which was set up in 1957. Cairo's reputation now covers journalism, radio and television, and research.

The chairman of the Egyptian Broadcasting Training Institute summed up a major problem of Arab teaching and training when he said that most of the best trainers have given up their jobs because they felt their work was not being appreciated. He said that he himself would not have accepted his office unless he could keep his "main work" as an engineer.

At the same time, the students themselves often show little interest – especially in radio. When Yemeni Radio advertised for announcers and editors for its English programme, it offered salaries close to what ministers get. Yet nobody applied for the jobs.

The team notes that analyses of the supply and demand for communication experts varied enormously. In one country, a senior official believed that the communication market was saturated. In other countries, it was said there was a shortage.

One reason, the team suggests, for what it regards as generally haphazard estimates of the training market-place, is that training needs are assessed only very rarely.

Sometimes a minister of communications will calculate its own requirements. But there is seldom any coordination between the ministry of communication and the ministries concerned with development, health, education, literacy, and so on.

In most cases, training courses never lack a heading, 'Communication Research'. But it has usually been inserted only to give the necessary "touch" and to make the course appear sophisticated and comprehensive. Most training institutions do not accord sufficient importance to this subject.

This absence of proper research is reflected at almost all levels throughout the Arab States. The only Arab research centre at the regional-level is the Arab Centre on Audience Research in Baghdad. This centre was established in close collaboration with the Arab States Broadcasting Union and the Iraqi National Centre for Social and Criminological Research.

During 1978, however, the Arab League Economic, Cultural and Social Organisation (in collaboration with UNESCO) will make a feasibility study on a major Arab centre for communication research.

Shortages of textbooks and other resource material is another hindrance in many of the centres. But several projects are underway. The Damascus Centre and UNESCO are considering an Arab version of a series of training booklets which UNESCO started to published in other languages in 1977. And ALESCO plans to start a series of communication monographs. •

Book Reviews

Election Broadcasts

For a long time UK election broadcasting has been heavily criticised for satisfying neither the politicians nor the broadcasters nor the public. Both the party politican broadcasts (produced by the politicians in special slots) and the broadcasters' own programmes are commonly regarded as superficial, lacking both information and credibility, and as often irrelevant to the main issues of the election (let alone to the UK's broader policy issues).

These faults have been analysed, and some important proposals made, in a new book **The Challenge of Election Broadcasting** (Leeds University Press; 91 pp; 1978; ISBN 0 85316 1178; £1.50) by Jay Blumler, Michael Gurevitch and Julian Ives. The book is the report of an inquiry by the Centre for Television Research, of which Dr. Blumler is director. Their inquiry had the full support of the BBC and IBA as well as of the three main political parties. As well as 'The Challenge of Election Broadcasting', focusing mainly on policy matters, the team is writing a more analytic work, 'Partisans and Professionals' (provisional title), that will examine the interaction between politician and broadcaster.

The book includes many lengthy quotes from politicians, party managers, reporters, broadcasting executives, etc, who speak openly (if anonymously) and frankly about the troubles of the existing restrictions.

Fundamental reform, says the book, is badly needed. The main theme of its review and proposals is that broadcasting coverage should be made more newsy and treated much more like the general run of non-election events; that there should be rather less coverage than at present; and that party political broadcasts should be replaced by a new series of 'Election Access' programmes in which the politician's presentations would be followed by an independent scrutiny.

The team found that – because the current party political broadcasts lack credibility – the parties are increasingly tending to regard the nightly news bulletins as their main platform. Party managers are compressing their main campaign statements into short, arresting two-minute sequences and concentrating on the acknowledgment newsworthiness – and visual familiarity – of the party leaders. A corollary of this trend is that there is very little opportunity to organise a thorough discussion, during the campaign, of any issue or event that may occur unexpectedly (such as a political controversy or scandal, or a strike).

Another fault of the present situation is overkill – in the words of the book, "imposing on the audience's tolerance for political matter by making it seem inescapable, incessant and indiscriminate." And the team criticise the various legal and regulatory controls that prevent broadcasters from applying normal journalistic criteria and techniques to politicians and political ussies during elections.

The team's proposal for a series of 'Election Access' programmes is the king-pin on which the rest hangs. If it is accepted, the regular news bulletins can give substantially less coverage to purely election matters.

Reporters and editors can be guided by their normal criteria. The main weight of election coverage should, the team suggests, be given to a separate nightly programme of news analysis.

The book has generally had a good reception by politicians and broadcasters. It has been published at a most appropriate moment. The BBC and ITV are already considering major changes to their main news bulletin and when the new schedules and programmes emerge they may well display some of the ideas of 'The Challenge of Election Broadcasting'. The proposals for greater journalistic independence, and more coverage of the issues, and rather less of the individuals involved, reflect major trends amongst the broadcasters themselves. *J.A.H.*

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Cultural Policies

The fourth of UNESCO's Conference on Cultural policies was held in Bogota on 10-20 January 1978. It covered Latin America and the Caribbean.

Previous conferences have been held in Europe, Asia and Africa and there are plans for a final conference in the Arab States before the World Conference on Cultural Policies that is being organised by UNESCO in 1981/2.

In preparation for the Bogota conference, UNESCO published two reports: **Intergovernmental Conference on Cultural Policies in Latin America and the Caribbean: Present Situation and Trends** (ref: CC/78/Americacult/4) and **Intergovernment Conference on Cultural Policies in Latin America and the Caribbean: Problems and Prospects** (CC/78/Americacult/3; CC/78/CONF. 201-COL-COL/7).

The first survey depends largely on a questionnaire sent out by UNESCO to the sixteen countries invited to the conference. It gives details, country-by-country, of national cultural policies, administrative structures, arts teaching, cultural education, financial aspects, etc.

The UNESCO Conference Secretariat have used this material and other information and ideas to provide in their second publication an annotated agenda of the conference. The secretariat has also provided a number of 'unofficial' comments on the three main agenda items of cultural identity, cultural development and cultural cooperation. Annexes contain the reports of preparatory meetings held in Panama, Kingston and Paris in 1976/77.

The role of communications is stressed several times, particularly in connection with cultural development. Communication is seen in terms of participation.

It is described as having a "fundamental role if it is true that a society may be defined as a set of individuals communicating with one another, and communication as the pooling of human experience". *J.A.H.*

Pierre Schaeffer at Jericho

Pierre Schaeffer is best known as the originator of 'musique concrete' which – to his own surprise – gave him a world reputation. But he is more: engineer, writer and a pioneer in French broadcasting. After 40 years of broadcasting, under 21 Directors General, he has complemented his many earlier books on communications with a collection of more personal reminiscences, **Les Antennes de Jericho** (Stock, Paris; 1978; ISBN 2 234 00522 1). As everything else Schaeffer has written – and done – this book is iconoclastic and idiosyncratic; a highly personal reflection on broadcasting, on people and events.

There is a fascinating account of the early times of radio in France, the establishment and work of the famous Studio d'Essai, the liberation of Paris and an extraordinary meeting with Jean-Luc Godard during May 1968. Schaeffer is sceptical, cynical, often bitter; he won't please many since he attacks to the right, to the left, and to the centre.

Even in his pessimism, he raised some disquieting questions: "The original sin of the media was undoubtedly contained in the initial act of multiplication: this multiplication was enough to pervert the word and image, to make them both incestuous and vain. The assumption of a 'client' dedicated to a 'socio-cultural product' is absurd. The error is to confuse a merchandise and a service, a show and an exchange, consumption and communication. Is this not to betray the essence of human intercourse, to surrender to entropy, and thus to descend, step by step, the quantitative energy scale down to absolute zero?"

Even if Schaeffer often seems to portray himself – and others – as getting lost in the paradoxy of the media hall of mirrors, he does come to one conclusion: that we must go beyond the "lonely crowd", beyond the isolation of the "mass individual". He says, "Hamlet's question is insufficient. It is the word of man alone. In spite of the respect for the human being, I persist in maintaining the two poles of the contradiction: to be or not to be together, that is the question."
Edward W. Ploman

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French-language Broadcasting

A unique report on French-language broadcasting organisations has been published by the IIC. The 694 pp report, **Guide des Radio-Télévisions d'Expression Francaise** (IIC, London; 1978; ISBN 0 88794 002 1; £3.00) was prepared by Jocelyne Limoges, Canadian Broadcasting Corporation. It is a companion volume to **Francophonie: Media et Cooperation** (IIC/CBC; 1977; ISBN 0 88794 000 5; £1.50).

It provides country-by-country information on the 31 countries that provide French-language broadcasting either exclusively or in part, including Algiers, Belgium, Canada, Congo, France, Luxembourg, Switzerland, Syria, Tunisia and Zaire. Each section provides information on the country's general features (population, languages, government, etc), summaries of media other than TV/radio (newspapers, news agencies, courses for training journalists, etc) and then full details of all radio and TV operations. *J.A.H.*

Books

Anatomie der Fernsehserie (v. Hase and Koehler, Mainz; 375 pp; 1976; ISBN 3 7758 0899 X; price on application) by Egon Netenjakob. TV producers examine the conditions of their work; the results of a 14-day workshop in which 30 authors, directors and producers discussed TV series and their audiences.

Aspen Handbook on the Media: 1977-79 (Praeger Publishers, 200 Park Avenue, NY 10017 and the Aspen Institute for Humanistic Studies, 717 Fifth Avenue, NY 10022; 440 pp; 1977; ISBN 0 915436 67 1; $6.95). This useful reference book has been updated and expanded to include a section on books in the field of mass communications; information on point-to-point communications; and more detailed sections on Canadian organisations, international communications agencies, media publications and biographies.

CIRTEF: Les Actes du Colloque de Juin 1977 (Conseil International des Radio-Télévisions d'Expressions Francaise, c/o Agence de Cooperation Culturelle et Technique, 19 avenue de Messine, 75008 Paris; 55 pp; 1977; price on application). A report of a Colloquy held in Montreal on the role of broadcasting in the development of society, and cooperation between broadcasters (see 'InterMedia', August 1977, page 20).

Citizens Media Directory (National Citizens Committee for Broadcasting, 1028 Connecticut Avenue, Washington DC 20036; 170 pp; 1977; ISSN 0363 843 X; $7.50) edited by Pamela Draves. A valuable directory listing media reform groups and services in the USA.

Commonwealth Broadcasting Association Handbook (CBA, Broadcasting House, London W1; 122 pp; 1976; free). This revised edition of the CBA handbook records origins of the association, gives examples of practical work, summarises the proceedings of the general conferences and gives a short history of each of the 45 member organisations.

Communication Yearbook 1 (International Communication Association, Transaction Books, New Brunswick, New Jersey 08903; 656 pp; 1977; ISBN 0 87855 206 5; $29.95) edited by Brent Ruben. A collection of 44 articles giving either an overview of a particular area of communication studies or analysing a specific issue. The section headings are Communication; Information Systems; Interpersonal Communication; Mass Communication; Organisational Communication; Intercultural Communication; Political Communication; Instructional Communication; and Health Communication. Authors include Kaarle Nordenstreng, Charles R Berger, James Anderson, Hamid Mowlana and Daniel Costello.

The Complete Handbook of Videocassette Recorders (Tab Books No. 811), Blue Ridge Summit, Pennsylvania 17214; 280 pp; 1977; ISBN 0 8306 6811 X; $5.95) by Harry Kybett. A comprehensive manual explaining what videocassettes are, and how they should be used. The book is written in two parts, covering operational producedures and maintenance; with illustrations throughout.

Den Dschungel ins Wohnzimmer (Haus der Evangelischen Publizistik, Friedrichstrasse 2-6, 6000 Frankfurt/Main; 198 pp; 1977; ISBN 921 766 007; price on application) edited by Rupert Neudeck. "The Jungle in the Living-Room"; foreign news reporting on West German TV. An anthology of essays; with a list of German studios and their overseas staff.

Die Zukunft der Zeitung: Die Dokumentation der Hamburger Medientage 77 (Hans Bredow Institut für Rundfunk und Fersehen, Heimhuder Strasse 21, 1000 Hamburg 12; 290 pp; 1977; price on application). The "Future of the Newspaper": with documentation of the Hamburger Medientage 77. It covers various regulations and legislation in Germany (FR) regarding the press, with lengthy discussions of the use of electronics and new media like teletext.

Dossier H . . . Comme Hersant (Editions Alain Moreau, 3 bis Quai aux Fleurs, Paris 4; 286 pp; 1977; price on application) by Dominique Pons. A critical, investigative analysis of Robert Hersant, French press magnate.

Etude Sur La Télédistribution et Les Raisons de Son Non-Développement en France (Genevieve, Talan, Université Pantheon-Sorbonne, Paris; 275 pp; 1977; price on application). A thesis (for a Diplome d'Etudes Superieures Specialisées on the development of cable television — or, as the title says, the lack of it — in France since 1972. Useful appendices contain the various laws and decrees that have affected cable television.

Fernsehtechnik von Morgen (ZDF, Mainz, Postfach 4040, Germany (FR). 78pp; 1977; price on application). "TV Technology of Tomorrow"; with articles on direct satellite broadcasting, cable television and uses of computers in TV.

50 Jahr Rundfunk in Österreich (Residenz Verlag, Salzburg; 235 pp; 1977; ISBN 3 7017 0184 9; price on application) by Viktor Ergert. The third volume of an historical account of Austria's broadcasting, covering the period 1955-1967.

Hazell (British Film Institute in association with Latimer New Dimensions, 14 West Central Street, London WC1; 260 pp; 1978; ISBN 0 85170 075 6 [hardback], 0 85170 076 4 [paperback]; £6.95, £2.95) by Edward Buscome and Manuel Alvarado. An account of the making by Thames TV of a drama series, 'Hazell', whose first series is currently being shown on ITV. Edward Buscombe is the Editor of Publications in the Educational Advisory Service of the British Film Institute; Manuel Alvarado is Education Officer for the Society for Education in Film and Television (SEFT) and editor of 'Screen International'. Both authors have long been closely involved in the use of semiotics and semiology in the analysis of TV and film (for which the magazine 'Screen International' is the main platform), and this book represents both a popularisation and a case study for their ideas. One slight worry is that 'Hazell' has been generally criticised as being unsuccessful; and that the authors' techniques would have been better applied to some of Thames TV's more successful productions. But the book does contain nevertheless a great deal of information, and many insights, about the making of drama for peaktime television.

International News and the New Information Order (Institute of Journalism and Mass Communication, Tampereen Yliopisto, University of Tampere, Kalevantie 4, 33100 Tampere 10; 149 pp; 1977; ISBN 951 44 0649 4; price on application) by Tapio Varis, Raquel Salinas and Renny Jokelin. Summaries of three aspects of the world information order arising from an international research project, "Transnational Communication": European broadcasting and the new information order; news agencies and the new information order; and Inter Press Service as a source for alternative news.

Jahrbuch zur Medienstatistik und Kommunikationspolitik 1973/4 (Volker Spiess, 1000 Berlin 62, Grossgörchenstrasse 6; 548 pp; 1977; ISBN 3 920889 44 4; price on application). An annual of media statistics and communications policies, covering the mass media in Germany (FR); it covers economic as well as consumerist aspects.

Jahresbibliographie: Massenkommunikation 1976 (University of Bremen, Postfach 2800 Bremen 33; 160 pp; 1977; price on application). A handy bibliography of 1976 international publications in the field of the mass media.

Learning for Change in World Society (World Studies Project, c/o One World Trust, 24 Palace Chambers, Bridge Street, London SW1; 120 pp; 1977; £1.75). The second publication by One World Trust, an educational charity, in its World Studies Project. The book has been designed to increase teachers' awareness of the many different ways of approaching the subject of world problems and current affairs. The book is set out in the form of lesson notes, and includes resource material for use in secondary schools; particularly schools in western democratic societies looking at the Third World. Contributions to the book's next edition are invited.

Long Range Intelligence Bulletin 11, Long Range Social Forecasts: The Future of Announcement Services (Reference LRIB 0011/SOF: Post Office Telecommunications, Telecommunications Systems Strategy Department, Long Range Studies Division, 38 Hills Road, Cambridge; 65pp; 1977; £5.25,. This

bulletin discusses the policy, marketing and technical issues that may arise in developments of the whole range of audio services – both centrally provided services, and decentralised services.

Mass Media and Ideological Change in Egypt (1950 – 1973) (University of Amsterdam, PO Box 1125, Hilvershum, Holland; 350 pp; 1977; £17.00) by Ibrahim Elsheikh. A study of the growth of the mass media in Egypt; the main theme is the extent to which the mass media have been socialist, and encouraged the development of socialism; both generally and in specific social groups.

Mass Media Policies in Changing Cultures (Wiley Interscience, New York; 291 pp; 1977; ISBN 0 471 01514 8; £12.80) edited by George Gerbner. Some of these 23 essays are brief, some more comprehensive; some are reprints, others are original; the sum is an interesting collection of ideas and analyses, which, though lacking any apparent single theme, does cover many of the basic issues.

News Flow between Canada and the United States (Communications Research Centre, S.I. Newhouse School of Public Communications, Syracuse University, Syracuse, N.Y. 13210; 87 pp; 1976; price on application) edited by Vernone H. Sparkes. The edited papers and proceedings of a Conference on US-Canada News Flow that was held in Syracuse in 1976.

Nordicom (Nordicom, Statsvetenskapliga Institutionen, Gothenburg University, Box 5048, S-40221 Gothenberg). Nordicom has published three separate volumes on Nordic research (the Nordic countries are Denmark, Finland, Norway and Sweden). The first, **Mass Communications Researchers** (ref: A/1/1978; ISBN 951 44 068 34), lists Scandinavian researchers in the field of mass communications, as of November 1977. The second book, **Scandinavian Mass Communication Research** (ref: A/2/1978; ISBN 951 44 0684 2) lists publications in the field of mass communication research that were produced over the same period. The third book, **Swedish Mass Communications Research** (ref: appendix to A/1 & 2/1978) is an appendix to the second. For various reasons, the Swedish contingent were not able to meet the deadline for the joint volume, and so published their own work separately. All three volumes replace earlier compilations and are more comprehensive, and extremely useful. The list of *researchers* gives details of names, titles, home addresses, telephone numbers, employment and main field of interest, or media and of interest. The two volumes on *research* list publications in English, French and German.

Ökonomie und Ideologie des Fernsehens: Aspekte zur Bewusstseinsbildung und Sozialisation in Japan (Klaus Winckler, Inaugural Dissertation, Erlangung des Doktorgrades der Philosophie, Ludwig-Maximilian University, Munich; 530 pp; 1977; price on application). A comprehensive account of the historical, legal, economic and ideological aspects of broadcasting in Japan.

OU: Mass Communication and Society (Open University Press, Milton Keynes; average 60 pp; average £2). A set of books designed for the Open University Social Sciences Courses on mass communications and society. The books comprise 15 units and are arranged in five blocks – The Media: Contexts of study; The Study of Culture; The Audience; Media Organisation and Media and Society. Of particular interest is Unit 5: Mass Communication in Cross-Cultural Contexts: the Case of the Third World.

Organisational Communication and Its Development (Viestintainstituutti, Institute for Human Communication [IHC], Mechelininkatu 15 A10, 00100 Helsinki 10, Finland; 61pp; 1977; ISBN 951 9462 00 7; price on application) by Osmo A Wiio. A description of a method of Organisational Communication Development (OCD) based on many years of organisational studies in Finnish work organisations using the Communication Audit Procedure developed by the Helsinki Research Institute for Business Economics (LTT).

The Producer as Author (Association of Directors and Producers, c/o Judy Steele, 6 Devonshire Place, London W1; 23 pp; 1977; free) by Anthony Smith. The 1977 James MacTaggart Lecture. The author traces the historical evolution of creative artists – particularly writers, but also painters, sculptors, architects, etc. – from the state of dependence on rich patrons to economic and cultural independence. He suggests that the TV producer is the last of the creative artists to achieve such independence; but that he will, and soon, given the increasing diversity of sources of funding, and opportunities of showing, TV material.

Putting Reality Together: BBC News (Communication and Society; Constable, 10 Orange Street, London WC2; 304 pp; 1978; ISBN 009 462040 [hardback], 009 462050 4 [paperback]; £8.50, £4.95) by Philip Schlesinger. An analysis of the operations of the making of the BBC's news. Dr Schlesinger spent 90 days in BBC newsrooms, and interviewed many BBC staff; he uses this information to investigate the BBC's position of impartiality in covering UK events, in particular the civil war in Northern Ireland.

Radio and TV 1978 – 1985: Proposals of the Swedish Broadcasting Commission (Ministry of Education and Cultural Affairs, Stockholm; 106 pp; 1977; price on application). The first official English summary of the report by the Swedish broadcasting commission into the future development of radio and television in Sweden.

Recent Books on Mass Media with British Imprints (Centre for Mass Communications Research, University of Leicester, 104 Regent Road, Leicester; 34 pp; 1977; price £1.50) by Connie Ellis. A list of mainly new books and some reprints on the mass media published in 1976-77.

Rymdbolaget: Teknisk Vardering av Olika Genom-forandealternativ for Nordsat (Svenska Rymdaktiebolaget, Tritonvagen 27, 171 54 Solna, Sweden; 60 pp; 1978; price on application). At the request of the State Delgation for Outer Space Activities, the Swedish Space Corporation (Rymdbolaget) has done a technical evaluation of the different options that have been proposed for the implementation of the Nordsat project; the report emphasises those aspects that have been most questioned, or seen as inadequately prepared.

Second European Congress on Information Systems and Networks: Luxembourg 27-30 May 1975 (Verlag Dokumentation Saur K. G, D-8000 München 71, Postfach 71 10 09; 231 pp; 1976; £10.00). Proceedings of the 2nd European Congress on Information Systems and Networks, held in Luxembourg, 1975.

Seventeenth Report by the International Telecommunication Union on Telecommunication and the Peaceful Uses of Outer Space (Committee on the Peaceful Uses of Outer Space, United Nations, 1 United Nations Plaza, New York 10017 [Ref: A/AC.105/213]; 31 pp; 1977; free). A short annual report on the action taken by the ITU with regard to non-military uses of outer space since December 1976. The annual annexe containing members' contributions will be published in the next few months and distributed free as a supplement to the ITU's 'Telecommunication Journal'. This report contains a most useful detailed summary of the World Administrative Radio Conference for the Planning of the Broadcasting Satellite Service in Bands 11.7–12.2 GHz (Regions 1 and 3) and 11.7–12.5 GHz (Regions 2). It also lists applications for the registration of frequencies for space radiocommunication (thus providing a survey of developments in 1977 and plans thereafter); and several other matters.

The Social Psychology of Telecommunications (Wiley Interscience, London; 195 pp; 1976; ISBN 0471 01581 4; £7.30) by John Short, Ederyn Williams and Bruce Christie. The preface states that this book is "written by and for social psychologists; however, its origins in the (now-defunct) Communications Studies Group of University College, London, ensure that the communication elements are well-informed and up-to-date. It raises, *inter alia*, the idea that more communication may not necessarily be desirable.

SYMPHONIE Nutzungsprogramm (Symphonie Executive Committee, Bonn/Evry; 1977; price on application) The paper gives aims, technical experiments, demonstration broadcasts, national news connections, etc, of the French/German Symphonie satellite programme.

Telecommunications and Regional Development in Sweden: A Progress Report (The National Swedish Board for Technical Development, Information Section, Fack, S-100 72 Stockholm; 38pp; 1977; price on application). A second report from the project, TERESE, following the first report in 1976 when the project was defined and its action

plan outlined. This report discusses the activities up to April 1977 and gives indications about further development plans.

The Use of Radio in Adult Literacy (Hulton Education Publications Ltd, Raans Road, Amersham, Buckinghamshire, in cooperation with the International Institute for Adult Literacy Methods, PO Box 1555, Tehran, Iran; 116 pp; 1976; ISBN 0 7175 0760 2; price on application) by Richard C. Burke. A useful handbook for those engaged in radio broadcasting literacy projects.

The Use of Satellite Delivery Systems in Education in Canada (Department of Communications, 300 Slater Street, Ottawa, Ontario; three volumes, in English and French, totalling about 200 pp with appendices; 1977; price on application) by A D Miller, R G Lyons, John S Daniel and D A George. The analysis is linked to the US/Canada Communications Technology Satellite (CTS), called Hermes. The three volumes cover (1) The Costing of Two Networks; (2) A Preliminary Needs Survey; and (3) Needs Survey: Second Round.

Video Fact Sheets (Information Liaison Unit, Studio 99 Video Ltd, 73/79 Fairfax Road, London NW6; 41 pp; 1977; £3.00). Selected reprints from some of the fact sheets prepared by Studio 99 Video including 'Your Lens and Its Life', 'Video in Scotland' and others on CCTV, Sound Sense and Lighting.

Video in Scotland (Studio 99 Video Ltd, 73/79 Fairfax Road, London NW6; 52 pp; 1976; £3.00). A survey of video facilities in Scotland, conducted by the Scottish Film Council. The research, which was undertaken in a three month period in 1976, was intended to prepare a comprehensive survey of video facilities in education, industry etc, and to provide information for users.

Wahlkampf in Fernsehen (Volker Spiess, 1000 Berlin 62, Grossgorschenstrasse 6; 292 pp; 1976; ISBN 3 920889 34 7; price on application) by Hans Jurgen Weiss. Electioneering battles on TV; some research into the role of TV debates during the election of the Bundestag (parliament) in 1972.

WDR: Überlegungen fur ein Kabel-Pilotprojekt in Koln (Westdeutscher Rundfunk 5000 Koln 1, Postfach 1850; 98 pp; 1977; price on application). WDR's proposal for a cable project in Cologne which, WDR hopes, might be one of the four pilot projects suggested by the Telecommunications Commission (KtK).

Whose Media? The Annan Report and After; A Citizen's Guide to Radio and Television (Consumers Association, 14 Buckingham Street, London WC2; 176 pp; 1978; ISBN 0 85202 144 5; £3.95) by Peter M. Lewis. A handbook and guide for the populist, citizens' use of broadcasting (both over-the-air and cable). The author summarises the recent Annan report on UK broadcasting and suggests various ways in which the post-Annan situation could allow greater flexibility, access and accountability. Peter Lewis was formerly manager of one of the UK's cable TV stations (Bristol Channel) and is one of the co-founders of the Community Communications Group (COMCOM). He uses his own experience, and COMCOM's, to provide a practical, down-to-earth, approach to citizens' control over and use of the airwaves.

Window Dressing on the Set: Women and Minorities in Television (US Commission on Civil Rights, Washington DC, 20425; 181 pp; 1977; price on application). A report on two issues of civil rights in broadcasting – the portrayal of minorities and women on network television, and their employment by television stations.

World Minorities (World Minorities Group, Quartermaine House Ltd, Windmill Road, Sunbury, Middlesex, UK; 167 pp; 1977; ISBN 0 905898 001; £3.75) edited by Georgina Ashworth, Research Director of the Minority Rights Group. The first in a series which, it is hoped, will become a world directory of minorities. The book contains brief but interesting summaries on 50 minority groups throughout the world – predominantly in South-East Asia.

Periodicals

ABT Informationen (ABT, Potsdamerstrasse 33, 1000 Berlin 30; irregular; ISSB 0340 3440; price on application). **No. 20** contains information on electronic data systems used in the fields of library and documentation in Germany (FR).

The CoEvolution Quarterly (POINT, Box 328 Sausalito, California 94965; quarterly; various subscription prices; single copy $3.00). This West Coast magazine is published by the makers of the Whole Earth Catalog and continues WEC's philosophy and style. The **Winter 1977/78** issue contains a special 94-page section on broadcasting as viewed (say the two guest editors, Larry Lee and Scoop Nisker) "at the end of the broadcast period." The articles include a summary of the forthcoming books by Gene Youngblood ('The Videosphere') and Jerry Mander ('Four Arguments for the Elimination of Television'); an account of Nikola Tesla, one of the founding fathers of electricity; a report on microwave radiation; an interview with Marshall McLuhan and Jerry Brown, Governor of California; and other news and comments.

Daedalus (c/o Stephen Graubard, 7 Linden Street, Cambridge, Massachusetts 02138; quarterly; $10.00). The **Winter 1978** issue is a special, 'A New America?' and includes an article, 'Just a Pleasant Way to Spend an Evening – The Softening Embrace of American Television' by Anthony Smith.

Der Spiegel (Brandstwiete 19, 2000 Hamburg 11; weekly; single copy DM. 2.50). The **12 December 1977** issue deals with broadcasting and violence in different countries; including a report on Dr. William Belson's research on TV violence and adolescent boys (see 'InterMedia', Vol. 5, No. 6).

Medium Nachdruck Videoarbeit 1: Beispiele aus Verschiendenen Landern and Medium Nachdruk Videoarbeit 11; Methoden, Organisationen, Gruppen (Gemeinschaftswerk der Evangelischen Publizistik, Friedrichstrasse 2 - 6, 600 Frankfurt/Main; irregular; £1/DM3.50). These two special editions contain reprints of articles published in 'Medium' between September 1975 and March 1977 on video work, with examples from other countries.

Presse: Dossier Thematique (Inex-SFP, 36 rue des Alouettes 75019; 1977; ISSN 0151 976 X; approx F. 5.00). **No. 226.** Compilations of newspaper clippings on video, mainly from the French press, covering 1977 and including a useful bibliography on local broadcasting and cable TV.

Radiotelevisioni (Informazioni Radio Televisive, Via Della Mercede 33, 00187; monthly; L. 15,000 pa). A new magazine on Italian radio and television. The first issue (**February 1978**) is a glossy, colourful collection of articles and news, mainly on local radio; most of the (numerous) ads are for private radio and TV stations. Articles include international and national frequency regulation (with a chart of Italian allocations); an open letter to the Minister of Posts and Telecommunications; and analyses and comments on the programmes and audiences of radio and television. Given the significance of the Italian situation, and its continual changes, 'Radiotelevisioni' should be a most useful information source.

Journal of Space Law (L.Q.C. Lamar Society of International Law, School of Law, University of Mississippi, Mississippi 38677; twice-yearly; $9.00). **Vol 5, Nos 1 & 2 (Spring and Fall 1977)** is a special issue devoted to a Symposium on International Organisation and the Law of Outer Space.

R.I. Periodical (American Newspaper Publishers Association Research Institute, PO Box 598, Easton, Pennsylvania 18042; monthly; price on application). **September 1977; Bulletin 1268.** An introduction to data communications – a guide to new communications media affecting future newspaper operations such as microwaves, fibre optics and waveguides.

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Do Other Planets Have TV?

THIS PLANET is continuously transmitting radio signals into deep space. And both the USA and the USSR regularly listen for radio signals that may have been generated by intelligent beings on other planets.

Listening for extra-terrestrial intelligence (ETI) is an enterprise of vast ambitions and significance. The notion that other planets might support intelligent life (given that the word "intelligent" is extraordinarily difficult to define) conjures up many concerns, fears, doubts. It is very probable that intelligent life does exist on many planets; but whether and how to try to contact extra-terrestrial intelligence, and the likely results of a contact, raise a whole series of issues.

At present, searching for extra-terrestrial intelligent life is very difficult. The problem is that there are infinite numbers of points in the universe and a definable but extremely large number of frequencies and means of transmitting from them. An intelligent being might be at virtually any point; and might use any frequency and any modulation and signal characteristics that we know of – or, indeed, that we don't yet know about.

But it is getting easier. Certain assumptions have been made. Astronomers have discovered that space contains numerous electrons and molecules which generate random radio signals. Although very weak, this 'noise' is nevertheless strong enough to interfere with 'search' signals.

There is however, a 'cosmic window', between approximately 1 GHz and 30 GHz, within which the 'noise' is minimal. Intelligent beings on Earth have assumed that intelligent beings on other planets have made this same discovery, and drawn the same conclusion that intelligent beings would attempt to contact each other on frequencies between 1 and 30 GHz. Another assumption narrows the target even more. The Earth's intelligent beings have reckoned that intelligence anywhere would favour the frequencies of the 'natural', universal elements – such as a hydrogen atom (1.653 GHz) or a hydrogen molecule (22.2 GHz). Most radio astronomers therefore use these and other 'natural' frequencies – both for listening and transmitting.

In the last few years, however, scientists have focused attention on a quite different kind of radio signal. The new opportunities were vividly described at the IIC Annual Conference in Washington last year by Carl Sagan. Dr Sagan is among those scientists, mainly astronomers in the USA and the USSR, who since the advent of the space age have shown particular interest in extra-terrestrial intelligence. In 1967 he wrote, jointly with the Russian astronomer I S Shklovsli, 'Intelligent Life in the Universe.' More recently, he designed the ETI search plaque that was placed aboard the US deep-space probe Pioneer-F.

At Washington, Dr Sagan said that the "one continuing indication of the development of intelligent life on Earth, as seen from space, is television. Television gets out. For 4½ billion years the Earth showed nothing of interest to a radio telescope on a distant planet. Then, thirty years ago, widespread television started up. We can imagine a kind of spherical wave, expanding at the speed of light away from the Earth, that is now 30 light years away." (The television programmes of 30 years ago – 'Howdy Doody', Milton Berle – are "our interstellar emissaries".)

A recent report by Woodruff T Sullivan and his team at the University of Washington, published in 'Science', the journal of the America Association for the Advancement of Science, analysed these and others of the Earth's radio emissions. Dr Sullivan and his team found that the Earth's most powerful signals are those sent by radar devices in defense systems. But the frequencies of these devices are often changed, for reasons of security, and so any extra-terrestrial intelligent beings would have difficulty in deducing the nature of the source, or of the planet.

Much more useful to such extra-terrestrial intelligences are the Earth's television stations. The Washington team counted about 15,000 transmitters around the world. It concentrated on the 2,191 whose effective radiated power (a standard measure) exceeded 50 kilowatts. These 2,191 stations actually account for about 97% of the Earth's total radiated power.

The USA has 999 of these large transmitters; Western Europe has 636; Eastern Europe 136; Japan, 108; and Australia 81. The study excluded China (PR) and the USSR.

The Washington team argued that by monitoring these TV signals, an intelligent extra-terrestrial observer could build up a rough sketch of the planet.

This method can be turned around and used by the Earth's own observing teams to search for extra-terrestrial intelligence. The Washington team suggest sweeping the spectrum on a very narrow bandwidth – say, 0.1 Hertz. Although a colour video signal takes up about 5 KHz, almost all the power is concentrated in a carrier signal of about 0.1 Hertz.

If it is assumed that most if not all intelligent societies use radio communications, then these signals can be used to collect simple data on each society. This awareness has encouraged the US National Aeronautics and Space Administration to start a major programme called the Search for Extra-Terrestrial Intelligence (SETI). Next year NASA's Jet Propulsion Laboratories will carry out a search on all frequencies and throughout the entire universe. It is expected to last five years.

One of the bonuses of the JPL search is that it uses relatively simple and low-power antennas. There have been several proposals for new and immensely powerful antennas. At present, the Earth's most powerful is the Arecibo Observatory, operated by Cornell University and the National Science Foundation, which consists of a 3,000 metre wide antenna in a valley in Puerto Rico. Some years ago Stanford University and NASA proposed a grid of 1,000 antennas, each 100 metres in diameter, called Project Cyclops. But the cost – about £5,000 million – is exorbitant.

It is very likely that, if intelligent life does exist elsewhere in the universe and if the use of radio is even moderately widespread, we may in the next few decades be listening to a signal that once carried some other planet's television programme. • J.A.H.